PAINT and VARNISH Production

THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER SYNTHETIC FINISHES

JULY
1959

50c per copy

Newport

NPT CONCENTRATE

Lowers End Costs

OF EMULSION PAINTS BASED ON VARIOUS LATICES

NPT CONCENTRATE is a product for use in latex paints based on butadiene-styrene, polyvinyl acetate, or acrylic latices.

When used in polyvinyl acetate and acrylic latex paints, Newport NPT CONCENTRATE improves the adhesion of latex paints over already painted surfaces.

It is a 100% solids content material, containing no solvent. It does contain a balanced combination of driers, eliminating the necessity of adding driers for it in any of the latex paints.

IMPROVES ADHESION IN POLYVINYL ACETATE AND ACRYLIC EMULSION EXTERIOR PAINTS

NEWPORT NPT CONCENTRATE improves the adhesion of these latex paints and should be instrumental in effecting a worthwhile reduction in raw material costs.

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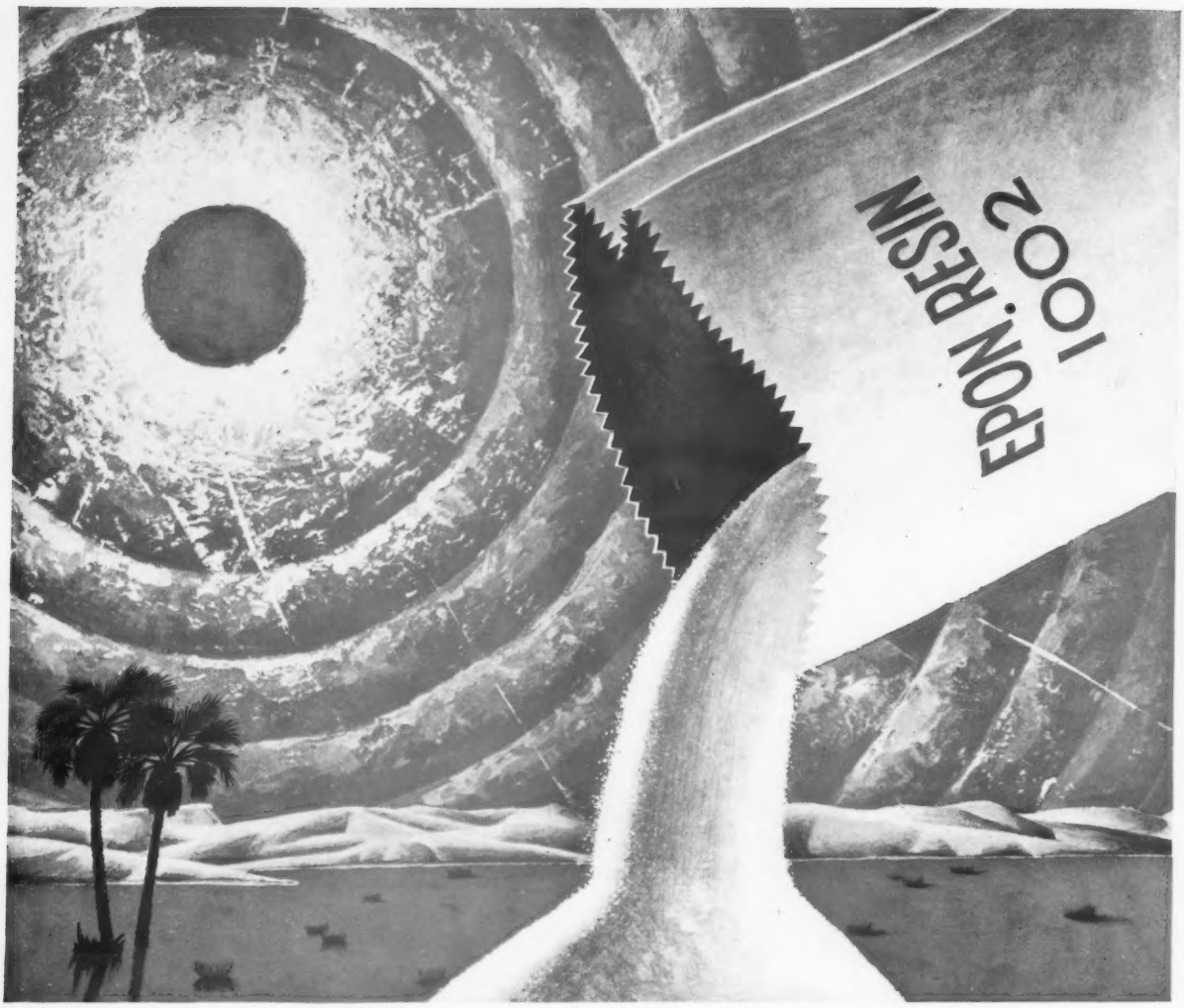

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Epon 1002 is similar in performance to Epon 1001. Coating systems based on either resin give superior impact resistance, flexibility, plus excellent resistance to water, boiling caustic, many acids and most solvents. If force curing is desirable, Epon 1002 coatings are resistant to over-bake.

For greater ease in handling, Epon 1002 is packaged in 50-pound, polyethylene-lined, multiwall paper bags . . . simple to store and use. For complete information, including technical bulletin SC:58-107, write to your nearest Shell Chemical district office.

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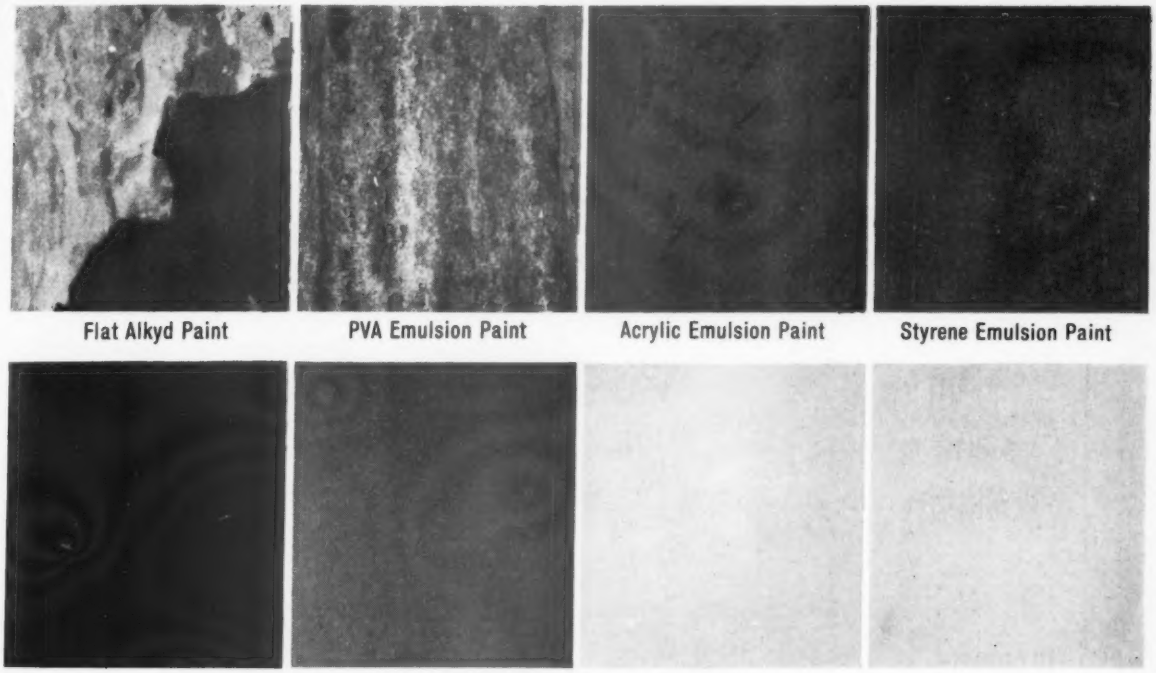
IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited, Toronto

SHELL

STUCCO PAINTS AFTER 12-WEEK "BLISTER BOX" TEST



Flat Alkyd Paint | PVA Emulsion Paint | Acrylic Emulsion Paint | Styrene Emulsion Paint

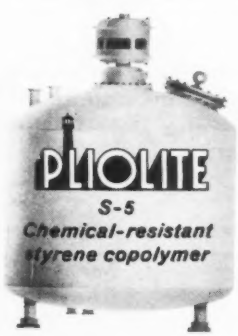
Paints Containing Pliolite S-5

How to weather a "blistering" attack

Here are the results of an intensive 12-week exposure test involving the most-used types of stucco paints—including paints containing PLIOLITE S-5.

Purpose of the test: to compare blister resistance and moisture transmission rates under conditions that parallel actual use. To accomplish this, asbestos-cement panels were striped with the paints to be tested. The painted side of each panel was exposed to winter weathering—including zero-degree temperatures. The unpainted side was subjected to continuous high humidity from water heated by an immersion element maintained at 180°F.

Under these severe accelerated conditions, paints containing PLIOLITE S-5 showed exceptional resistance to blistering, flaking and efflorescence. The photographs above tell the story. For more information on PLIOLITE S-5—including latest *Tech Book Bulletins*—write Goodyear, Chemical Division, Dept. G-9450 Akron 16, Ohio.



GOODYEAR

Pliolite—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

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CURING TO A HARD CHEMICAL RESISTANT FILM AT 250°F. IN 30 MINUTES
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NO DISCOLORATION WHEN OVERBAKED UP TO 350°F.
CHEMICAL RESISTANCE SUPERIOR TO THAT OF AMINE MODIFIED ALKYDS
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BETTER GLOSS AND GLOSS RETENTION ON OVERBAKE

Photo courtesy J. O. Ross Engineering Division Midland-Ross Corp.

then start formulating with

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RCI's baking acrylic copolymer

This new Reichhold vehicle has been developed specifically for the formulation of one-coat baked metal finishes combining a high degree of chemical resistance with outstanding durability. Its adhesion to both bonderized steel and aluminum particularly qualify it for use in coatings for metal furniture, metal kitchen cabinets, electric fans and other small appliances. For further information including specifications and starting formulae, write for Bulletin SC-34.

IMPORTANT: orders for RCI resins, chemicals and colors can often be combined to earn applicable quantity prices.

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W. A. COOK & ASSOCIATES
161 E. Grand Ave.
Chicago 11, Ill.
WHitehead 4-2260
Midwest Advertising Representatives

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NEXT ISSUE

Solvent-resistant polyvinyl alcohol coatings with good weathering properties will be discussed in the August issue. Using water as the principal solvent, these coatings are formulated to form acetals that resist solution. The effects of various ingredients on the coating properties will also be presented.

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EDITORIAL COMMENT

Field Testing Is Important!

During World War II, there was some question as to the advisability of employing red-lead paints in tanks used for potable water. As a result of a laboratory study undertaken by the United States Public Health Service at that time, it was suggested that the use of lead paint be prohibited in tanks and standpipes used for the storage of potable water. This suggestion was based on the fact that some lead was dissolved from panels coated with red-lead paints.

At the request of the Lead Industries Association, the Massachusetts Department of Public Health undertook a study in 1950 to determine to what extent lead was dissolved in water from several standpipes which had been painted internally with lead paint. This study involved the analysis of 70 samples of water from 11 standpipes coated with: (1) red lead in linseed oil, (2) red lead in a phenolic vehicle, and (3) lead chromate in a phenolic vehicle.

It was found that of the 70 samples of water, only three contained significant amounts of lead and these were from tanks in standby service. Furthermore, tests of the extraction of lead from panels coated with red-lead oil paint indicate that no significant quantity of lead is added to the average water supply by the paint if the average daily consumption approaches the capacity of the tank. Also, if a phenolic base paint with a red-lead pigment is used, a substantially lower rate of turnover is essential to keep the lead concentration below significant levels. While the findings of this study conclusively prove that the use of red lead paints on the inside of standpipes for potable water is not harmful, there is another aspect of this study which brings to our mind a thought; that is, field testing should supplement laboratory testing in any evaluation program. This was effectively demonstrated when one of the nation's largest rayon manufacturers promoted the use of crimped rayon in large carpets based on the results of wear-testing machines. The wear-testing machines showed that carpets made of crimped rayon stood up better than carpets made up of a smooth type of rayon. By actually having people walk over the two kinds of carpet, it was found that the crimped rayon wore about twice as fast as the smooth rayon.

The foregoing examples point up the inadvisability of relying too heavily on accelerated tests in determining the performance of any coating in various applications.

"Built In" Stability

The Battelle Memorial Institute has recently undertaken a project aimed at discovering a practical way of making wood less subject to shrinkage and swelling due to changes in humidity.

Taking a page from textile chemistry, one approach that is being given serious consideration is the use of chemicals that will cause so-called "cross linking" reactions within the wood fiber. By chemical reaction, molecular "braces" can be built between the long parallel chains of molecules that are the basic structure of wood and many other materials. These cross links tend to discourage shrinkage or swelling. Another approach is to use certain gelatinous materials to fill the micro-voids in wood. This method would be aimed at maintaining the wood continuously in a partially or completely swollen state.

The problem of improving the stability of wood has been of interest for some fifty years but no practical solution has yet evolved. The cross linking process seems to be a novel and plausible approach and it will be interesting to see what success this technique will have in improving the stability of nature's age-old building material.

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Write for technical information on Marbon 1100 TMV Resin

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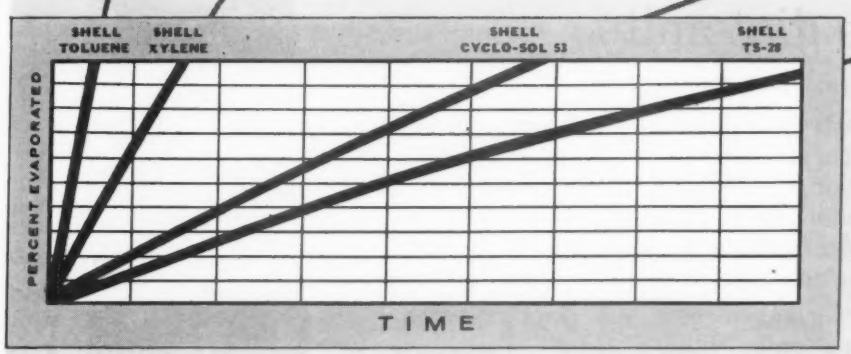

These Shell solvents cover a very wide range of evaporation rates. Their individual characteristics satisfy specific requirements in a great variety of formulations.

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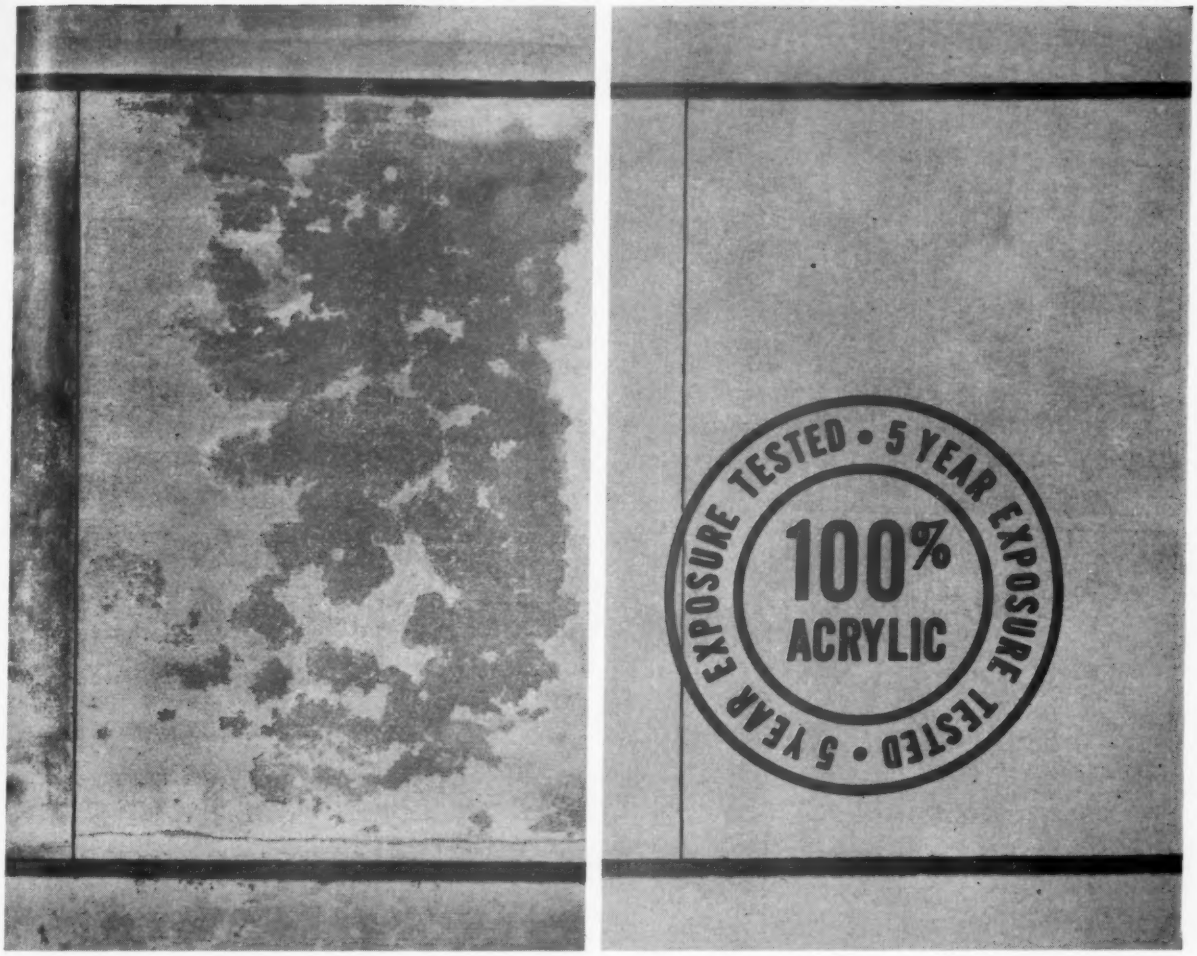

Where alkali resistance is a must . . . formulate with RHOPLEX AC-33

The unglazed cement-asbestos shingles above were painted at the same time and put on exposure immediately. Within one year, free alkali extracted from the shingle by rain had destroyed the widely used emulsion paint at the left. The shingle coated with paint made from RHOPLEX AC-33 100% acrylic emulsion is still unchanged. This is typical of commercial paint jobs now in their 5th year of service in all climates from Northern Canada to the tropics.

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SKELLYSOLVE EH? BY GOLLY, IT'S WORTH A TRY.
LATER
LOOK AT THESE FIGURES, JONES . . . PRODUCTION'S WAY UP!! HOW'D YOU DO IT?
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NICE GOING, JONES!!
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SURE, AND I'M RECOMMENDING YOU FOR A RAISE!! THANKS FOR TIPPING ME OFF TO SKELLYSOLVE!!

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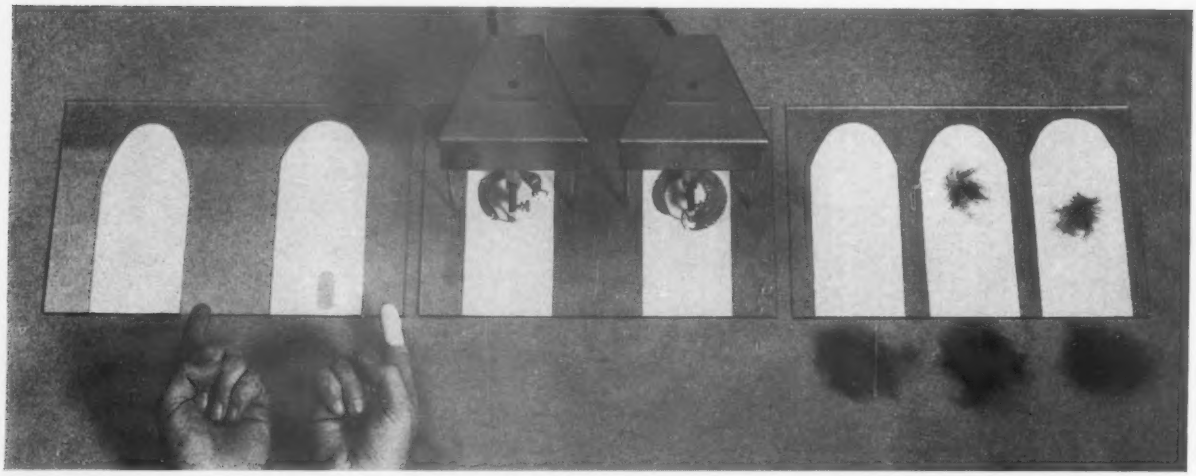

FINGER TEST... Left Drawdown – Safflower – IPA base . . . Right Drawdown – Tall F. A. – IPA base

DRY TIME RECORD – 24 hour cycle . . . Left Drawdown – Safflower – IPA base... Right Drawdown – Linseed – IPA base

COTTON PUFF TEST... Left Drawdown – Safflower – IPA base... Center Drawdown – Tall – F.A. – IPA base... Right Drawdown – Linseed – IPA base

By test—finger, circular dry-time recorder and cotton puff—all these tests prove that Safflower Oil in the isophthalic alkyd produces a coating with the fastest initial-dry, best through-dry, and least after-tack.

Fastest initial-dry — proved by time-honored finger test. This average 3-5 hour set up is slow enough to prevent lapping troubles, speedy enough to diminish dust and insect collection.

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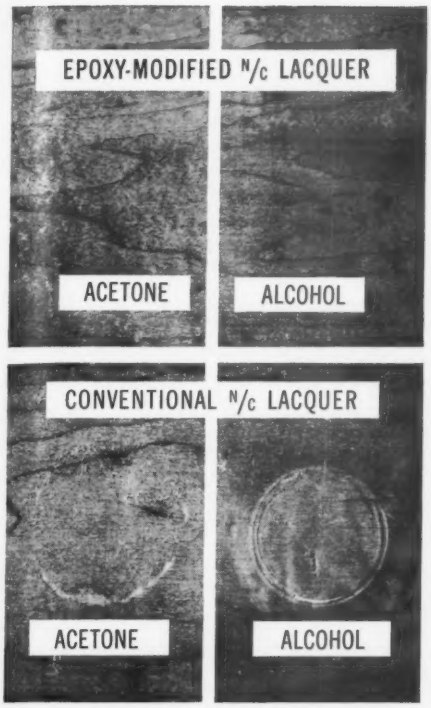

These panels, subjected to identical treatment, show the resistance of epoxy-modified nitrocellulose lacquer to spills of alcohol or acetone (nail polish remover).

Du Pont shows you how to give nitrocellulose lacquers 9 lives

by adding the chemical resistance of epoxies

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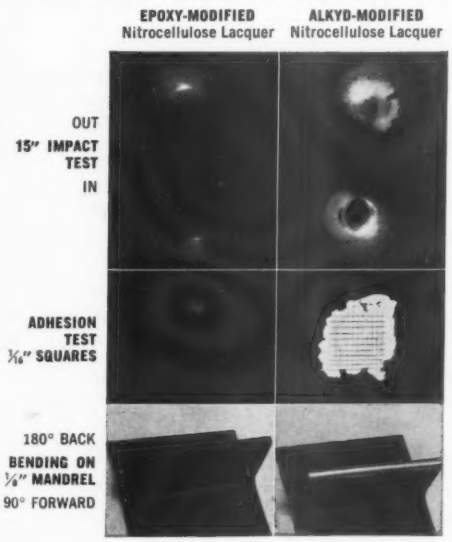
On Unprimed Aluminum, tests show the superior adhesion and durability of epoxy-modified nitrocellulose lacquer (below) made by new technique.



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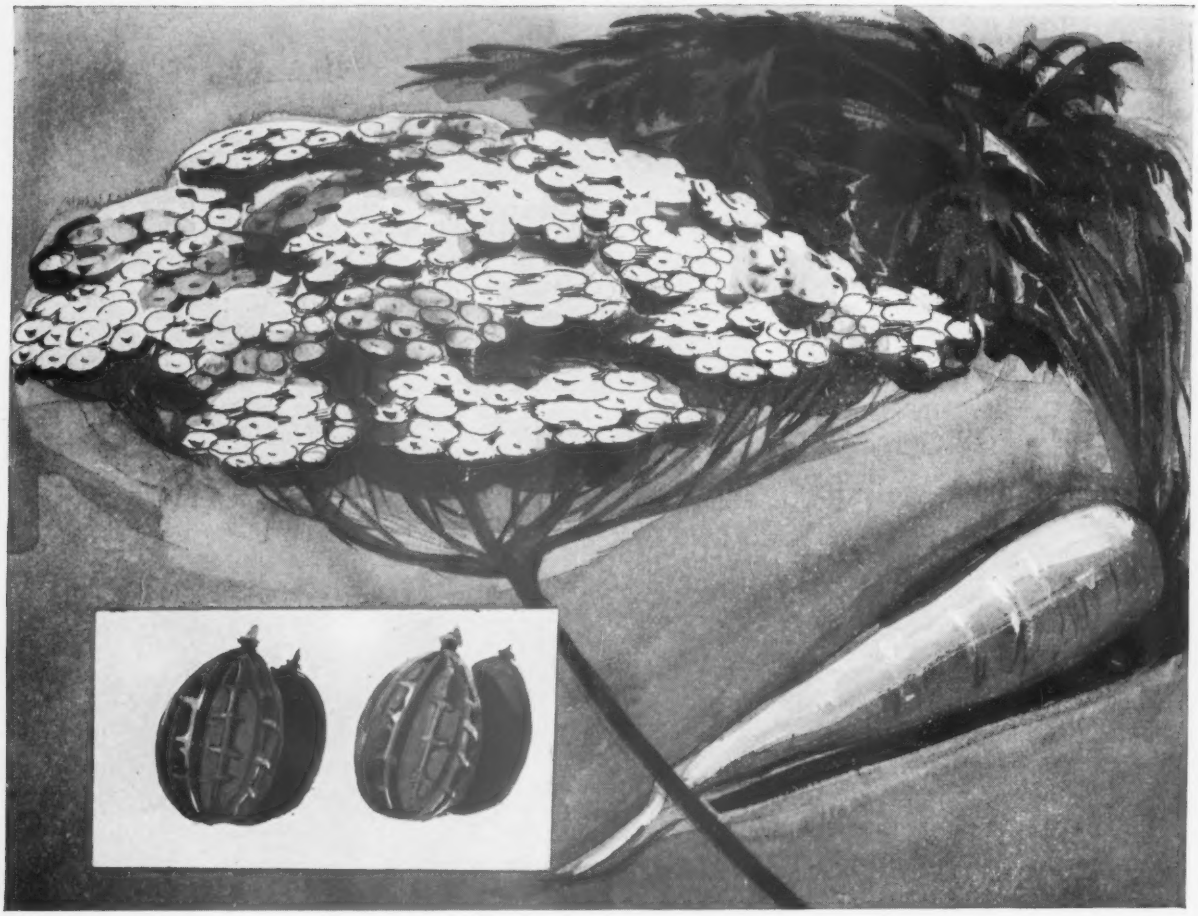

They're both seeds, but...

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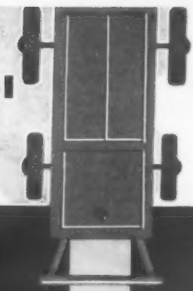

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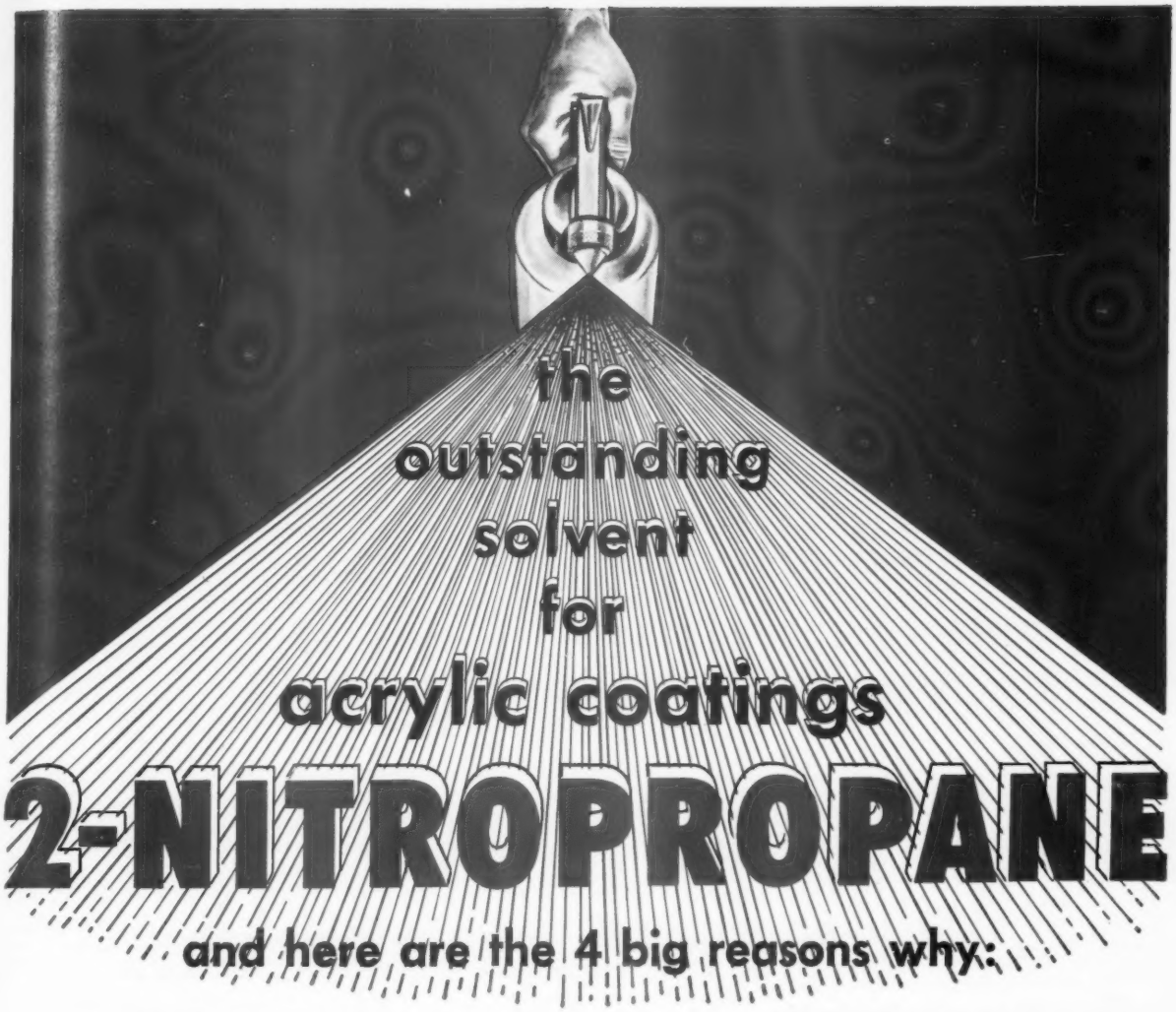

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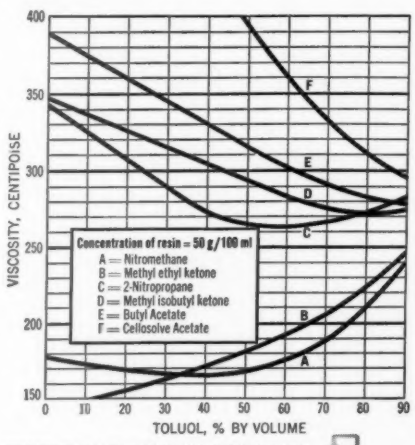

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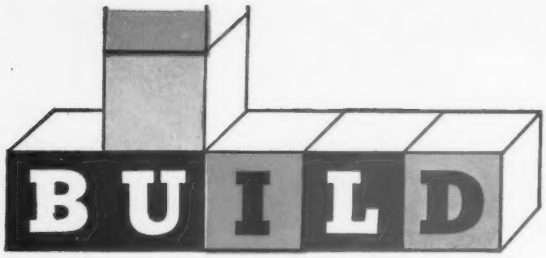

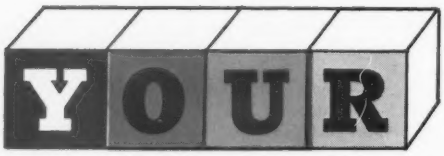

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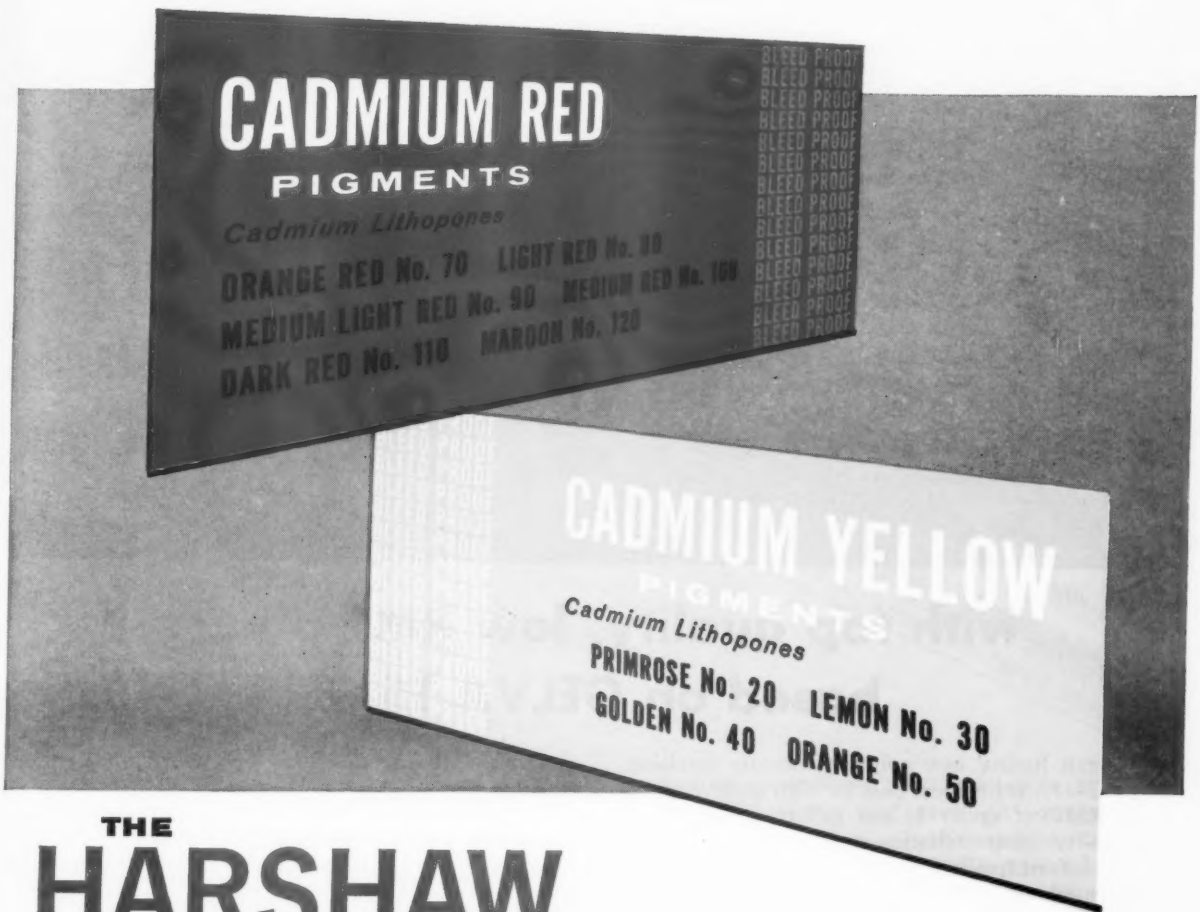
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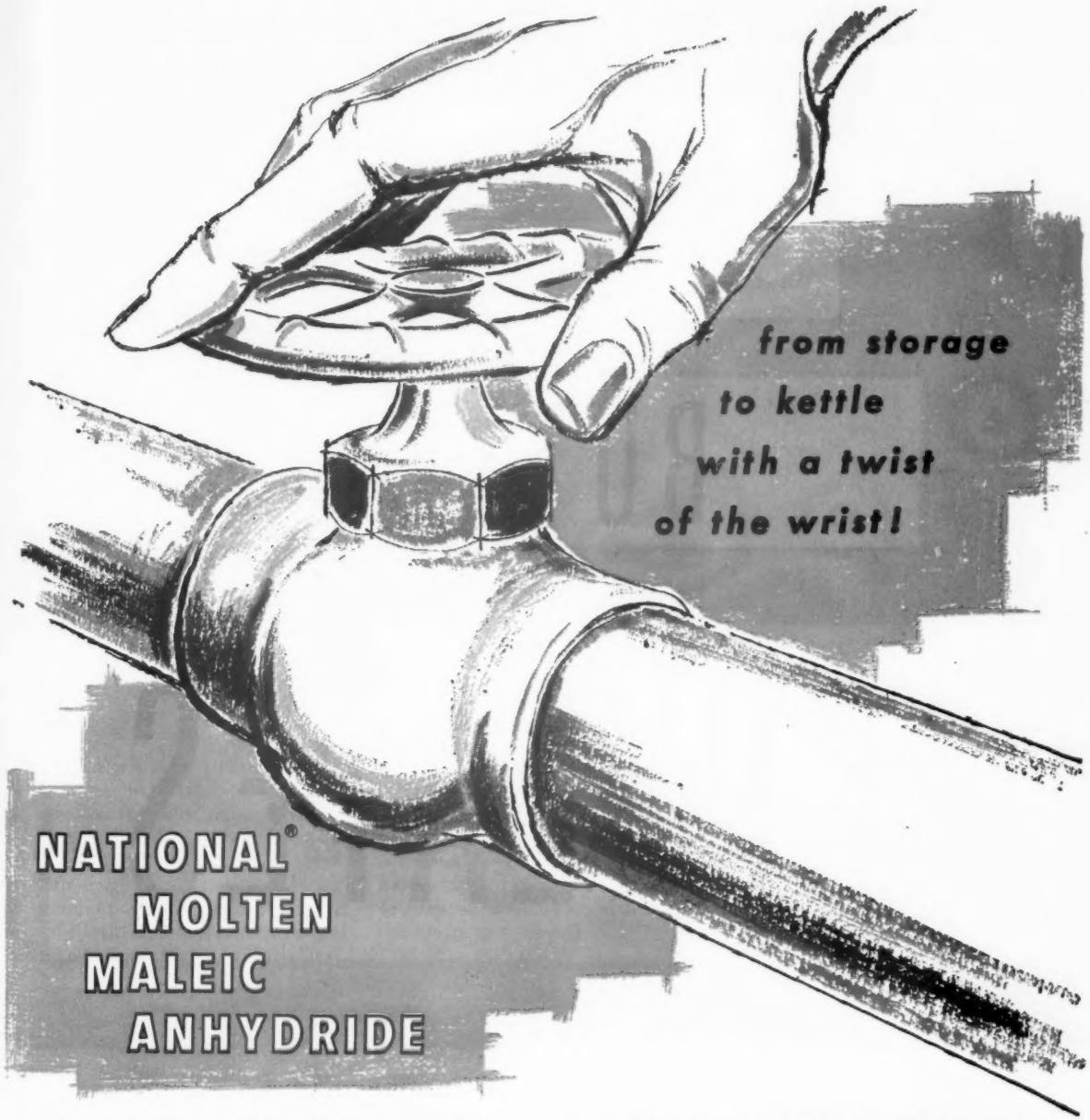

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WATER ABSORPTION and SALT-FOG RESISTANCE of CORROSION INHIBITING PAINTS

By
Henry F. Payne*

THE work in this paper is part of an investigation of corrosion resistant paint systems for steel structures sponsored by the Florida State Road Department and the Engineering and Industrial Experiment Station of the University of Florida. Each paint system consisted of two coats of primer and two coats of finish paint. The systems were applied to 20 gage, cold rolled steel panels and tested for exterior exposure, accelerated exposure, salt-fog resistance, and hardness and impact resistance. This paper describes some of the results obtained in the salt-fog and water absorption tests.

In the salt-fog test the paint systems were rated for degree of blistering and extent of removal of the coating at two cuts which were made through the coating to the bare steel. It was found that the rate and degree of blistering was determined chiefly by the type of film-former in the primer and was not affected significantly by the type of pigment in the primer, or the finish coat used over the primer. Little or no blistering developed on paint systems in which the primer had a drying oil as the film-former but medium to severe blistering occurred when resins such as phenolic varnish, alkyd, or epoxy ester were blended with the oil or used as the entire film-former.

Duplicate sets of these coated panels are on exposure racks on the Florida Keys and also in Gainesville, Florida. However, no blistering has developed on the panels at either location which indicates that the salt-fog test cannot be used as an accelerated method to determine the corrosion resistance of coatings for steel structures in Florida. The salt-fog test may be satisfactory for coatings which are wetted continuously with water or salt solutions.

It was observed that where blistering occurred, the blisters developed first between the two finish coats or between the finish coats and the primer coats and not at the interface of coating and metal. Blister formation between coats also was observed on free films and on coated glass cloth used in water absorption and transmission tests. This indicates that the classical theory which states that blisters form by accumulation of water and loss of adhesion at the metal-coating interface should be modified.

It has been shown that moisture is absorbed and passes through coatings on steel by a combination of inhibition pressure and osmotic and electroendosmotic forces. These forces must overcome the primary and secondary valence forces in the structure of a coating. However, at the interface of two coatings in a multiple-coat paint system there are no primary valence forces; only the weaker secondary valence forces bond the two coats together. Therefore, moisture passing through the system accumulates at the interface because of lower resistance, and the pressure developed may cause blistering. Simultaneously, moisture is permeating to the next interface where it again accumulates in the area of reduced resistance and produces enlargement of the blister. Subsequently, moisture reaches the substrate followed by loss of adhesion and further enlargement of deepening of the blister. If blisters are examined only at this final stage they will appear to start by accumulation of water and loss of adhesion to the substrate. However, the above

*Organic Coatings Laboratory, Chemical Engineering Dept., University of Florida, Gainesville, Florida.

This paper was presented before the Div. of Paint, Plastics and Printing Ink Chemistry of the American Society in Chicago, September 7-12, 1958.

Composition Variables, Percent by Weight											
Pigment Combinations	**A**		**C**		**D**		**E**		**F**		**G**
Red Lead	99.6		16.0		55		20		—		—
Pigment M 50*	—		—		—		—		99.4		55
Zinc Yellow	—		8.0		10		10		—		10
Iron Oxide	—		55.0		—		35		—		—
Zinc Oxide	—		4.0		—		—		—		—
Mg Silicate	—		—		25		25		—		25
Mica, WG 325	—		17.0		10		10		—		10
Al Stearate	0.4		—		—		—		—		—
Bentone 34	—		—		—		—		0.6		—

Film-formers Solid Basis	**1**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Raw Linseed Oil	75	—	50	50	—	50	—	50	50	50	—
Bodied Linseed (Z_2)	25	—	25	—	—	—	—	25	—	—	—
Alk. Ref. Linseed		75	—	—	—	—	—	—	—	—	—
Linseed-Tung**		25	—	—	—	—	—	—	—	—	—
Alkyd Resin+			25	50	100	—	—	—	—	—	—
Tall Oil Alkyd						50	100	—	—	—	—
Phenolic Varnish								25	50	—	—
Epoxy Resin Ester										50	100

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Pigment Combination . . . C . . . SRD Spec. 514.4 Alternate Prime Coat, Code Z-C
Pigment Combinations . . . D-G . . Experimental
Film-former . . . . . 1 . . . Fed. Spec. TT-P-86A
Film-Former . . . . . 3 . . . Spec. 514.4 Alternate Prime Coat, Code Z-C
Film-formers . . . . . 4–10 . . . Experimental

Table 1. Standard and experimental primers.

Composition Variables, Percent by Weight				
Pigment Combinations	**I**	**J**	**K**	**L**
Titanium Dioxide	13	15	15	15
35% Leaded ZnO	29	55	25	10
B. C. White Lead	28	—	25	40
Mg Silicate	18	20	25	25
Mica WG 325	12	10	10	10
Lamp Black	T*	T	T	T

Film-formers Solid Basis	**2**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Raw Linseed Oil	100	50	50	—	50	—	50	50	50	—	46
Bodies Linseed (Z_2)	—	25	—	—	—	—	25	—	—	—	—
Alkyd Resin**		25	50	100	—	—	—	—	—	—	—
Tall Oil Alkyd					50	100	—	—	—	—	—
Phenolic Varnish							25	50	—	—	54
Epoxy Resin Ester									50	100	

* T – amount necessary for tinting to standard color
**Fed. Spec. TT-R-266, Type I

Pigment Combination . . . I . . . SRD Spec. 514.5 Codes B-8 and B-9
Pigment Combinations . . . J-L . . . Experimental
Film-former . . . . . 13 . . . SRD Spec. 514.5 Codes B-8 and B-9
Film-formers . . . . . 2, 4-12 . . Experimental

Table 2. Standard and experimental finishes.

observations indicate that the coating-substrate interface is not the primary site of blister formation, and loss of adhesion to the substrate is not the complete mechanism of blistering phenomena.

A correlation was obtained between water absorption and permeability to water provided the coatings did not blister in these tests. When blistering occurred the results were erratic and no correlation was obtained. The results also indicate that paint systems are more susceptible to blistering when immersed in water than when subjected to a saturated atmosphere.

Experimental

The control paint system in this investigation consists of two coats of the State Road Department (SRD) Spec. 514.4 Alternate Prime Coat, Code Z-C, and two coats of SRD Spec. 514.5 Grey Finish Coat, Codes B-8 and B-9. The film-former in the primer is a combination of 90% linseed and 10% tung oil, and the finish coat is based on 46% linseed and 54% of a linseed-tung oil phenolic resin varnish. The experimental paint systems were based on linseed oil, combinations of linseed and phenolic varnish, alkyd, and epoxy ester, and the synthetic resins as the entire film-former. The various combinations are given in Tables 1 and 2. These tables also show the variation in pigments for both primer and finish coats. The primers were pigmented to produce 35% PVC (Pigment Volume Concentration in the dry coating) and the finish coats at 32% PVC.

Application and Salt-Fog Testing

Two coats of the primers and two coats of the finishes were brushed on steel panels with a minimum of 48 hours and a maximum of 72 hours air drying between coats. The total film thickness of the coatings ranged from 5-6 mils. There were 48 different paint systems in this series and they were numbered 55-102 inclusive.

The first set of panels prepared for the salt-fog test were air-dried in the laboratory at 80-85° F. for 28 days. Before placing the coated panels in the salt-fog cabinet two cuts were made through the coating to the bare metal on each panel. The cuts were 2″ long and 1/16″

wide and were placed 1" apart horizontally in the center of the panel.

The panels were placed in the cabinet and subjected to a salt-fog of a 5% NaCl solution. The panels were examined each day and rated for extent of blistering and amount of coating which could be removed adjacent to the cuts by a light pressure with a spatula. Blistering and removal were rated as follows: 10 = no failure, and zero = complete failure. The removal was considered complete when the entire coating between the two cuts had been removed. When this occurred some of the coating above and below the cuts also was removed. The data obtained from the first set of panels lead to the conclusions given in the introduction to this paper. Since these conclusions were somewhat unusual it was decided to check the results on another set of panels which had been given a longer drying period. The second set were air-dried in the laboratory for 48 hours, then exposed on the Gainesville, Florida, test fence for 70 days (June 25—September 3). The two cuts then were made through the coating on these panels and the panels subjected to the 5% salt-fog.

In order to simplify the mass of data obtained for these two sets of panels a condensation is given in Tables 3 and 4. These tables show the ratings for extent of blistering at 200, 300, and 600 hours and the number of hours at which removal of the coating between the two cuts was complete, or R = O. The ratings for both series of panels are given; the first is designated Series A and the second Series B.

P #	Film Former	Series A Blistering Hours 200	300	600	Hours R-O	Series B Blistering Hours 200	300	600	Hours R-O
Primer: Constant; red lead, linseed oil Finish: Variable film-former. Pigment, Med. ZnO except P 57 Al.									
55	Std.	10	9.5	9	1000+	10	9.5	9	1000+
56	Std.	10	10	10	1000+	10	10	9.5	1000+
57	Oil	9.5	9	9	1000+	10	9.5	9	1000+
58	Oil: Alkyd	10	10	10	1000+	10	9.5	9	1000+
59	Alkyd	10	10	9	1000+	10	9.5	9	1000+
60	Oil: Var.	10	9	9	1000+	10	9.5	9	1000+
61	Oil Epoxy	10	10	9	1000+	10	9.5	9	1000+
62	Epoxy	10	10	9	1000+	10	9.5	9.5	1000+
Primer: Constant; SRD Standard Finish: Variable film-former. Pigment, Med. ZnO except P 64 is Al.									
63	Std.	10	10	9	1000+	10	9.5	8	1000+
64	Std.	10	10	9	1000+	10	9	9	1000+
65	Oil.	10	10	10	1000+	10	9.5	9	1000+
66	Oil: Alkyd	10	10	9	1000+	9.5	9	8	1000+
67	Alkyd	10	10	9	1000+	10	9	8	1000+
68	Oil: Var.	9	9	9	1000+	9.5	8	7	1000+
69	Oil: epoxy	10	10	9	1000+	9.5	9	7	1000+
70	Epoxy	10	10	9	1000+	9.5	9.5	9	1000+
Primer: Variable film-former; Pigment constant, high red lead Finish: Variable film-former; Pigment, Med. ZnO Same film-former in primer and finish									
71	Oil	9	9	9	504	10	10	9	1000+
72	Oil: Alkyd	8	8	5	816	8	6	4	912
73	Alkyd	8	8	5	816	7	5	4	648
74	Oil: Var.	10	9	8	816	9	7	6	648
75	Oil: Epoxy	9	8	5	816	9	8	5	1000+
Primer: Variable film-former; Pigment constant, high M50 Finish: Variable film-former; Pigment constant, Med. ZnO Same film-former in primer and finish									
76	Oil	10	10	10	672	10	9.5	8.5	1000+
77	Oil: Alkyd	8	7	4	960	7	6	4	744
78	Alkyd	6	5	3	960	7	6	3	1000
79	Oil: Var.	9	8	6	320	7	6	3	528
80	Oil: Epoxy	8	7	4	960	8	7	5	816
Primer: Constant; low red lead, linseed oil Finish: Variable pigment, film-former linseed oil									
81	High ZnO	9	9	8	672	10	9.5	9	1000+
82	Med. ZnO	10	10	9	672	10	10	9	912
83	Low ZnO	10	10	9	960	10	10	9	1000+

Table 3. Rate of blistering.

Despite the increased hardness of the Series B coatings the data for blistering and removal confirm those obtained from Series A. The data show that the degree of blistering in the salt-fog test is determined chiefly by the film-former in the primer and is practically independent of the type of pigment in the primer or the finish coat used over the primer. In order to obtain additional evidence for this conclusion, the salt-fog test was run on a set of panels which had been given a 3600 hour test in the Weatherometer.

There were 26 panels in this set and they were numbered 1-51 using the odd numbers only. The variable in the paint systems on these panels is the primer; the same finish coat was used on all panels. The finish is the SRD Standard Grey described previously. The variations in pigment and film-former in the primers are given in Table 5, together with the ratings for blistering and the hours at which removal was complete.

Despite the greater hardness of the coatings on these panels due to the prolonged exposure in the Weatherometer the same general results were obtained regarding blistering and film removal. Little or no blistering occurred on systems containing primers having oil as the film-former despite large differences in pigmentation of the primer. Increased blistering was obtained when oil was replaced with resin and maximum blistering resulted when the film-former was 100% alkyd resin.

Condensation of the salt-fog on the panels in the cabinet provided the opportunity for absorption from the liquid phase. This occurred to some extent because the coatings were softened and lost cohesive strength to varying degrees de-

P #	Film Former	Series A Blistering Hours 200	300	600	R-O	Series B Blistering Hours 200	300	600	R-O
Primer: Constant; low red lead, oil-alkyd film-former Finish: Variable pigment, oil: alkyd film-former									
84	High ZnO	7	6	4	960	8	7	3	744
85	Med. ZnO	8	7	5	960	8	6	4	648
86	Low ZnO	8	6	4	816	8	6	3	696
Primer: Constant; low red lead, alkyd film-former Finish: Variable film-former; Pigment, Med. ZnO except 93-high ZnO, 94-low ZnO									
87	Oil	6	5	–	504	6	5	–	480
88	Oil: alkyd	6	4	2	816	7	6	2	696
89	Alkyd	6	4	2	816	7	6	1	816
90	Oil: Var.	4	2	–	384	6	5	—	576
91	Oil: epoxy	6	4	–	576	7	6	2	648
92	Epoxy	7	7	5	1000+	8	7	3	696
93	Oil: alkyd	5	4	–	504	8	7	2	648
94	Alkyd	6	7	3	960	7	6	1	696
Primer: Constant; low red lead, oil-varnish film-former Finish: Variable film-former, Pigment Med. ZnO									
95	Oil: Var.	10	10	–	312	7	6	–	576
96	Oil: Epoxy	9	9	–	312	8	7	–	576
97	Epoxy	9	8	8	816	9	8	7	816
Primer: Constant; low red lead, oil-epoxy film-former Finish: Variable pigment, oil-epoxy film-former									
98	High ZnO	9	8	6	960	9	8	5	1000+
99	Med. ZnO	9	8	5	816	9	7	5	816
100	Low ZnO	8	8	6	816	8	8	6	744
Primer: Constant, low red lead, epoxy film-former Finish: Variable film-former, Pigment Med. ZnO									
101	Oil: Epoxy	8	8	4	1000+	7	6	2	816
102	Epoxy	8	7	6	1000+	8	7	5	816

Table 4. Rate of blistering.

pending on their composition, and it appeared softening and swelling of film structure were related to the blistering and removal phenomena.

Water Absorption and Transmission

An attempt was made to determine if a relationship existed between the observed blistering on steel panels and water absorption and water transmission of the coatings as free films and also applied to glass cloth as a support. Eight paint systems were selected as being representative of the entire group. In five of these systems the film-former in the primer was the variable with the finish coat held constant. In the remaining three systems the same film-former was used in the primer and finish coats but a different film-former in each system. The composition of the primers and finishes in the eight systems is given in code form in Table 6. The letter in the code represents the pigment and the number is the film-former. The code may be deciphered by reference to Table 1 and 2.

Two coats of primer and two coats of finish were sprayed on No. 2840 Fiberglas tape (Horace Linton Div., Hess, Goldsmith Co.) and also on mercury amalgamated tin panels. The final coat was applied on April 7 and the coatings tested at the times shown later. All coatings were air dried in the laboratory at 80-85° F.

Absorption tests were made in distilled water and also in 5% NaCl solution. Squares of free film and coated glass cloth, 1½ x 1½ inches, were weighed and immersed in water and salt solution. The samples were removed periodically and pressed between lint free, wet-strength paper towels to remove surface moisture before reweighing. Each reweighing was made between 45 and 60 seconds after removal of surface water to obtain uniform moisture conditions. The rates of water absorption from distilled water and salt solution are shown in Figure 1.

The marked difference in absorption from distilled water and salt solution is shown clearly in Figure 1. However, the order for absorption of the systems is the same with the exception of systems 1 and 5. No blistering developed on coatings immersed in the salt solution but blistering occurred on systems 1, 2, 5, and 7 in distilled water. The time at which these systems started to blister is indicated by arrows on the curves in Figure 1. It will be noted that systems which blistered did not reach equilibrium absorption over the 14-day test period, but the others attained equilibrium, and No. 6 lost weight slightly. Additional discussion of the absorption data is given later.

The permeability or moisture vapor transmission of the coatings on glass cloth was determined by the Payne Cup method. Discs of the coated cloth were placed in Payne cups with the coated side toward the water in the cups. The loaded cups were weighted and maintained in a desiccator at 85° F. with P_2O_5 as the desiccant. The area of the coating exposed to moisture in the cup is 10 cm^2 and the usual way of expressing film thickness in the paint industry is in mils, therefore the specific permeability of the coatings is given as mg. H_2O/10 cm^2/mil/day under the temperature and desiccant conditions given above. The values for thickness in mils and specific

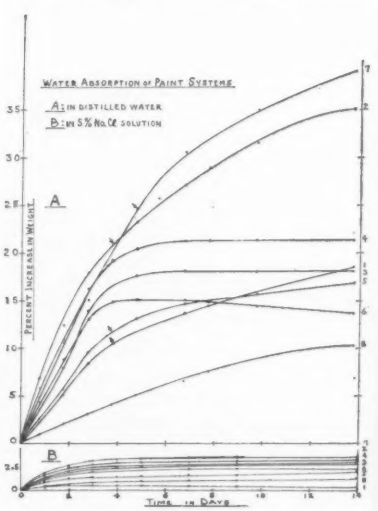


Figure 1.

permeability are given in Table 7. Also included are the values for percent water absorbed in 14 days from A = distilled water and B = 5% NaCl solution.

At first glance there does not appear to be good correlation between permeability and water absorption. However, if the data are arranged in two groups (Table 8), one which has the coatings that did not blister in the absorption test and the other having the coatings which blistered, a correlation will be seen in the first group.

The above arrangement shows that blistering is an important factor in the absorption characteristics of the coatings. The coatings in Group 1 which did not blister decreased in the same order for absorption from distilled water and 5% NaCl solution, and permeability to moisture. However, the coatings in Group 2 which blistered did not show this correlation between absorption and permeability.

When the coatings were removed from the Payne cups it was observed that Systems No. 2 and 5 had blistered in the permeability test. The coatings were replaced in the cups and were maintained for 14 days under laboratory conditions instead of in the desiccator. Removal of the coatings from the cups showed that no additional systems had blistered under the saturated atmosphere in the cups over this time period. *These results indicate* that paint systems are *more susceptible to blistering* under conditions of *immersion* in water than under a water saturated *atmosphere.*

Water Transmission

In view of these results it was postulated that resistance to blistering might be measured if the paint systems were immersed in water and a pressure applied to one side of the coatings. The transmission cell shown in Figure 2 and 3 was devised to investigate this postulate. The cell was machined from Plexiglas rod and the two halves held together with clamps. The paint systems coated on glass cloth were used as membranes between the two halves of the cell. The loaded cells were tested for leakage before placing distilled water in both halves of the cells. The hydrostatic head on each side of the membrane was held constant by adjusting the height of the receiving pipette. Pressure was applied from a cylinder of nitrogen through a mercury manometer and distributed evenly through a manifold with connections to each

Primer: Variable pigment and film-former as shown below
Finish: Constant; SRD Standard Grey

P #	Variable Film-former	BLISTERING 200	300	600	Hours R-O
(A) Pigment: red lead					
1	Oil	10	10	9.5	1000+
(D) Pigment: High red lead					
3	SRD Std.	10	9.5	9.5	1000+
5	Oil	10	10	10	1000+
7	Oil: Alkyd	9.5	9	9	1000+
9	Alkyd	9.5	8	7	1000+
11	Oil: Var.	9.5	9.5	8	1000+
13	Oil: Epoxy	9.5	9	8	1000+
(E) Pigment: Low red lead					
15	Oil	10	10	9.5	1000+
17	3 Oil: 1 alkyd	10	10	9.5	1000+
19	Oil: alkyd	9.5	9	8	1000+
21	Alkyd	9	8	7	1000
23	Oil: Talkyd*	9	9	8	1000+
25	T. Alkyd*	9	8	6	892
27	3 Oil: 1 Var.	10	10	10	1000+
29	Oil: Var.	9.5	9	8	1000
31	Oil: Epoxy	9	8	7	988
33	Epoxy	9.5	9	7	892
(F) Pigment: 100% M50					
35	Oil	10	9.5	8	1000
37	Oil: Alkyd	9	7	6	988
39	Oil: Var.	9	8	5	652
41	Oil: Epoxy	8	7	6	892
(G) Pigment: High M50					
43	Oil	10	10	10	1000+
45	Oil: Alkyd	8	7	6	892
47	Alkyd	8	6	4	892
49	Oil: Var.	8	7	5	652
51	Oil: Epoxy	9.5	8	6	1000+

*T.Alkyd = Tall Oil Alkyd

Table 5. Rate of blistering.

System #	1	2	3	4	5	6	7	8
Primer	A-1	C-3	E-6	E-5	E-12	E-6	E-5	E-12
Finish	I-13	I-13	I-13	I-13	I-13	K-6	K-5	K-12

Table 6. Compositions for paint systems for water absorption and transmission.

System #	1	2	3	4	5	6	7	8
T in Mils	9.8	10.8	7.4	8.6	7.6	8.25	9.0	8.0
Spec. Perm.	79.9	82.5	52.3	70.4	36.7	41.6	65.4	16.6
% H_2O Abs. A	18.5	35.1	18.2	21.5	16.9	13.7	39.1	10.2
% H_2O Abs. B	0.38	3.10	2.23	2.52	1.90	2.11	3.48	1.30

Table 7. Film thickness and specific permeability of paint systems.

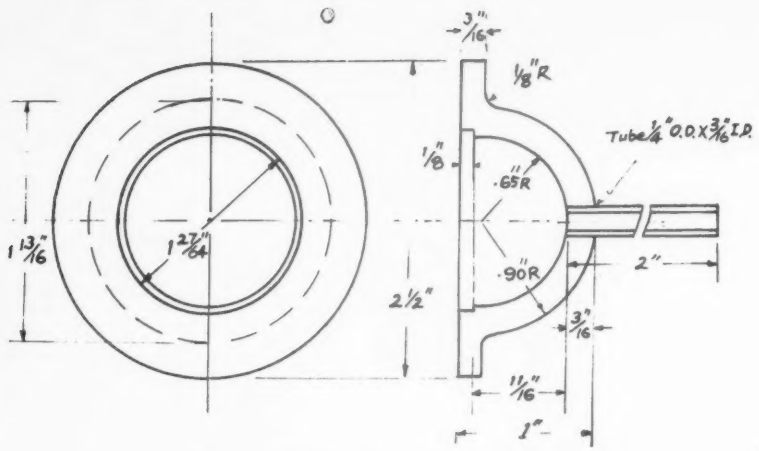


Figure 2. Schematic diagram of transmission cell.

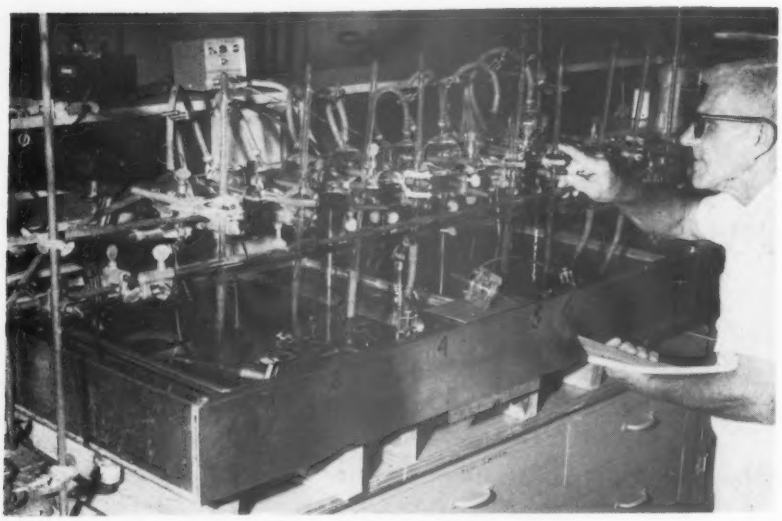


Figure 3. Operating transmission cell.

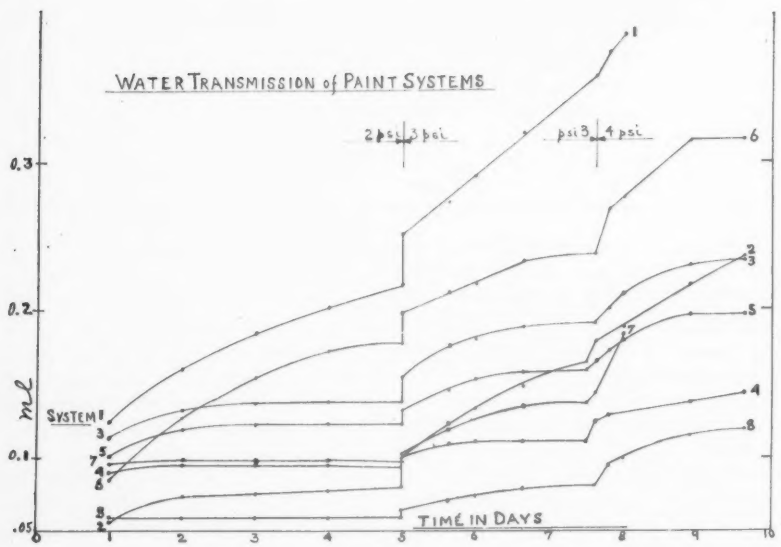


Figure 4.

transmission cell. The loaded cells were immersed in a water bath maintained at 85°F. Pressure was applied to the primer side of the coated glass cloth and the amount of water transmitted through the 10 cm^2 area of the coating was read directly on the pipette. Blistering of the finish coat could be observed because the Plexiglas cells are transparent. The actual rate of transmission through the eight paint systems was corrected for variation in film thickness. Therefore the data plotted in Figure 4 are the ml. of water/mil thickness/10 cm^2 area at 85° F.

Since the coated glass cloth samples are somewhat flexible a bulge develops when the pressure is applied to the cell. The bulge produces a rise in the water level in the pipette. The maximum rise occurs in from 5 to 10 minutes but 30 minutes was allowed before transmission readings were taken. Figure 4 shows that transmission was measured at 2, 3, and 4 psi. Transmission was rapid during the first 24 hours then decreased and in some cases it stopped entirely. It would appear that water absorbed by the coating produced swelling of the film structure and the pressure of 2 psi was not sufficient to overcome film resistance in most cases.

As may be expected system No. 1 with the primer based on linseed oil was the softest and weakest structure and the rate of transmission was highest and apparently reached an equilibrium rate at 2 psi. System No. 2, with a 90:10 combination of linseed and tung oils in the primer, also reached an equilibrium rate of transmission but it was much slower due to the stronger and more water resistant film structure. System No. 6, having alkyd resin as the film-former in both primer and finish coats, showed high initial transmission but it decreased and stopped after 5 days. As may be expected System No. 8, with epoxy ester in both primer and finish coats, had low initial transmission and the rate stopped after 24 hours.

Increasing the pressure to 3 psi produced an increase in the bulge which was greatest on the softest coating, System No. 1. The rate of transmission also increased through this coating and also through Sys-

tem No. 2, and both systems again developed an equilibrium rate at this pressure. However, all other systems had an initial increase in transmission then it decreased and transmission stopped in about 3 days.

Increasing the pressure to 4 psi produced another increase in the bulge but Systems No. 1 and 7 lost resistance completely and developed a very rapid rate of transmission. There was no apparent rupture in these coatings; their structures apparently swelled and distended to the point at which water was transmitted through relatively large pores. System No. 2 showed another increase in rate, and System No. 4 now gave a steady rate of transmission. All other systems reached an equilibruim rate in about 2 days.

It is apparent that the new transmission cell can be used to measure the resistance of coatings to the transmission of liquids or gases under various pressures. Further work will be done to prevent the bulge by insertion of a disc of a rigid porous material such as fritted glass in the cell. This would permit testing free films rather than films on glass cloth, and also the use of higher pressures.

It was observed that all systems except No. 6 and 8 developed blisters after 4 days in the transmission cells. Blistering increased somewhat over the 10 day test period but none appeared on No. 6 and 8. More systems blistered in the transmission test than in the absorption and permeability tests but it will be recalled that all systems blistered in the salt-fog test. In addition, the systems which had very bad blistering in the salt-fog test did not blister in the other tests. These results are summarized in Table 8 where the + sign indicates blistering and the minus sign no blistering, and 10= no blistering, O=complete blistering. Included also are the values for hours at which R=O (removal of coating was complete) and rating for (R) the extent of removal after 1000 hours in the salt-fog test.

The data in Table 9 show that least blistering occurs when the coatings are in contact with water vapor, more blistering develops with immersion in liquid water, and additional blistering results from immersion with applied pressure. It would appear that a pressure greater than 4 psi was developed in the salt-fog test because all coatings blistered in this test. This pressure, or driving force may be considered to be the electroendosmotic force described by Kittelberger and Elm (1, 2) and Gay (3). This force is developed when the electrical potential gradient cause by corrosion is superimposed on a water concentration gradient across the coating. This occurs in the corrosion process and simultaneously hydroxyl ions are liberated at the cathodic areas on the metal surface. The development of an alkaline condition at the interface of coating and metal is presumed to weaken the adhesion of the coating and blisters formed from the combination of osmotic and endosmotic processes (3).

However, this theory needs to be modified in view of the observation discussed previously that blisters form first between the coats of a paint system and not at the interface of coating and metal. Blister formation between coats also was observed on free films and coated glass cloth used in the water absorption, permeability, and transmission tests. It was also observed by H. G. Rains in his discussion of the paper by Gay (3). Rains described the blistering of finish coats over primers that were unaffected.

Consideration of the mechanism by which water penetrates paint films, and the forces which operate in multiple-coat paint systems suggests the reason for blistering to occur first between the outer coats of the systems. The forces which operate in each coat are the primary valence forces which result from autoxidative polymerization and also some remaining secondary valence forces. However, the forces which operate between the various coats of a paint system are secondary valence forces only. Secondary forces are much weaker than primary forces therefore, the interfacial area between coats should offer less resistance to the inhibition pressure developed when water is absorbed into paint systems. This permits water to accumulate at the interface and develop sufficient pressure to distend the outer coat and produce blisters. Simultaneously, water continues to permeate the system and finds another area of reduced resistance at the next interface between two coats. This again allows accumulation and development of pressure and blister formation. Subsequently, water reaches the substrate and the ac-

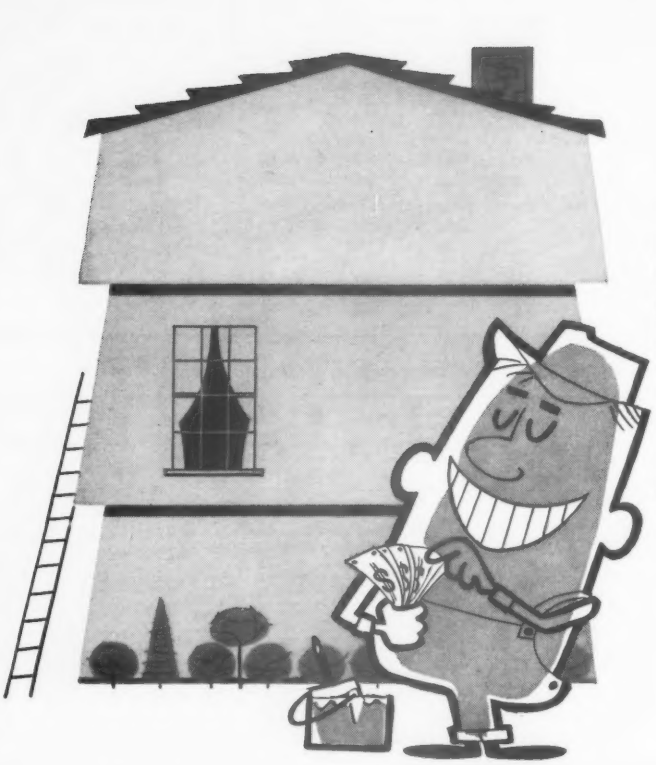
(*Turn to page 85*)

Group #1: No blistering in water absorption test			
System No.	% Abs. H_2O	% Abs. NaCl	Spec. Perm.
4	21.5	2.52	70.4
3	18.2	2.23	52.3
6	13.7	2.11	41.6
8	10.2	1.30	16.6
Group #2: Blistered in water absorption test			
7	39.1	3.48	65.4
2	35.1	3.10	82.5
1	18.5	0.38	79.9
5	16.9	1.90	36.7

Table 8. Extent of blistering in water absorption tests.

System No.	1	2	3	4	5	6	7	8
Permeability	—	+	—	—	+	—	—	—
Absorption	+	+	—	—	+	—	+	—
Transmission	+	+	+	+	+	—	+	—
Salt-Fog								
200 hrs.	10	10	9	9.5	9.5	6	6	8
300 hrs.	10	10	8	9	9	4	4	7
600 hrs.	9	9	7	8	7	2	2	6
Hrs. for R-O	1000+	1000+	1000	1000	892	816	816	816
R at 1000 Hrs.	10	9	0	0	0	0	0	0

Table 9. Extent of blistering in various tests.



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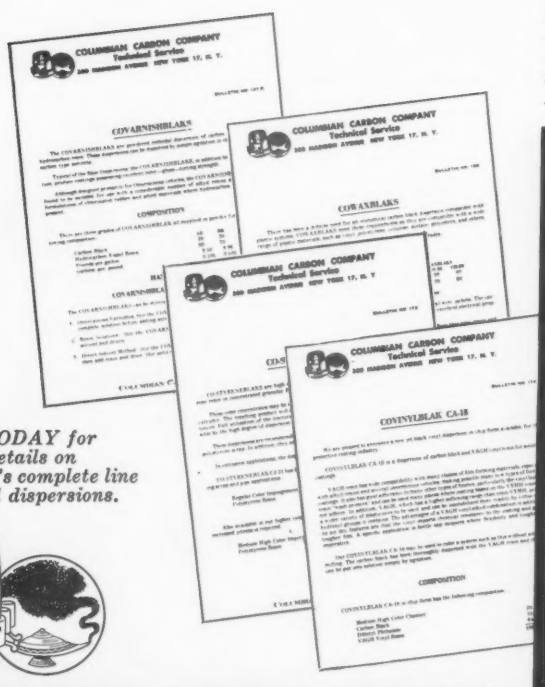

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ALKYD EMULSION FOR ARCHITECTURAL FINISHES

By
William L. Hensley
and
R. E. Layman

THE use of water paints is very old. Compounds of sour milk and burnt lime were in use by ancient civilizations. They did not know, however, that they were making calcium caseinate. Egg whites were used by artists of the middle ages as binders for their paints. A glue-whiting-chalk combination was popular sixty years ago. This was called kalsomine. Improvements were constantly sought. Casein powder paints were introduced at about the same time, again a calcium casinate compound. Casein paste paints appeared and were enthusiastically received at the time of the Chicago Worlds' Fair in 1933. These casein paints were modified with alkyd resins. Paints based on alkyd resins emulsified with casein were recognized as sufficiently important in 1940 to be covered by a Federal Specification TT-P-88.[2]

Even the best of these paints were deficient in some properties. The alkyd emulsion paints still contained casein both as a thickner and stabilizer. They showed numerous disadvantages, and in the final analysis had little to recommend them, except that they were water thinned and were superior to any other aqueous vehicles developed up to that time. The disadvantages included unreliable stability, poor freeze-thaw resistance, tendency to clog paint brushes and slow development of water resistance. The presence in the paint film of casein, emulsifying agents and other additives, resulted in the loss of many of the outstanding properties of an alkyd resin finish.[4]

Then, about 1949, came a new "rubber base" latex paint[3]. You are all familiar with the instantaneous and continuing success of latex paints. Because of their ease of application, one coat finish possibilities, minimum odor, washability and easy clean-up, latex paints today command half of the very large flat wall paint market.[5]

Meanwhile, the technology of solvent-thinned paints was not exactly marking time. Progress in improving the slow drying but easy brushing oil paints was being made too. Oleoresinous varnishes provided faster dry and harder films with less penetration. These paints, however, were poor in color retention. The gelled oil calcicoater provided a low cost, non-penetrating, easy brushing finish, but the rather porous films in general were low in scrub resistance. Copolymer oils gave hard drying films, and as a group had a tendency toward embrittlement, but were generally good[3].

Solvent-thinned alkyd flat paints were introduced later. They are fast drying, easy brushing, non-penetrating, non-yellowing, resist scrubbing, and remain reasonably flexible after aging.

The flat wall paint market was conditioned by the higher priced latex paints for the acceptance of solvent thinned alkyd resin flats. Alkyd resin technology had developed to a point where excellent flat paints could be formulated long before the price conscious public was willing to buy them. They represented the ultimate in quality and for this reason, despite the disadvantage of being supplied in organic solvent, have come from behind to command the other half of the flat wall paint market[5].

Why then, at an equal price per gallon, do solvent thinned flat alkyd paints continue to be popular? The proprietor of the largest paint store in our town explains it this way. The solvent-thinned paints are more "fool proof." They can be applied over hard glossy surfaces without fear of crawling or poor adhesion.

Furthermore, an independent testing agency[6] found that "all the latex paints tested are described as flat, but generally do not produce the really soft matte finish of a good alkyd paint. . . None of the latex paints scored as high in sheen uniformity as alkyd paints. . . . A charcteristic sometimes objec-

The authors are associated with the American Cyanamid Co., Research Div. Stamford Laboratories, Stamford Conn.

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tionable in latex paints is their tendency to get shiny when rubbed."

Alkyd vs Latex

Solvent-thinned alkyd flat paints are not critical with regard to application temperature, they flow and level well, are non-foaming, non-corrosive, and show no significant difference between wet and dry hiding. They are dead flat, show excellent adhesion over hard and glossy surfaces, and develop good hardness and washability.

Latex paints today are made from three principal types of thermoplastic latex: butadiene styrene, polyvinyl acetate or acrylic ester. Each of these latices has its own desirable characteristics. Without discussing the differences imparted by individual latices, latex paints may be characterized in general by easy application and easy water clean-up. They have no "paint odor" although it must be admitted that they do have an odor of their own. They may be brushed or applied by roller, but do not have the good leveling of alkyd paints. They have good washability and easy stain removal. Freeze-thaw resistance varies from passable to excellent. Sheen and color uniformity are good. Color retention and water spotting resistance (because of modifying agents used) will vary from poor to excellent.

With the above comparison in mind, if an alkyd resin flat paint could be supplied in water, and the desirable properties (which have enabled it to command half the flat wall paint market) could be preserved, it should be a very interesting product. This paint should go on easily, show good adhesion to glossy substrates, should not clog the brush, should have good lapping characteristics, should develop a dead flat sheen with good washability and yet retain the very desirable feature of easy water clean-up.

Perhaps the logical route to such a paint is by means of an emulsion. An emulsion is a heterogeneous system, consisting of at least one immiscible liquid intimately dispersed in another in the form of droplets, whose diameter, in general, exceeds 0.1 micron[1].

We are making emulsions daily by such simple operations as washing with soap and water. Soap is the oldest and certainly best known of the anionic active emulsifying agents[1]. Oils and greases are emulsified by soap and rinsed off with water. A modern, improved, stable alkyd resin emulsion is available, specifically designed for the preparation of flat wall paints, which enables the formulator to make superior products. It is "Cyaqua" alkyd resin emulsion 405-20. The characteristics of 405-20 are shown in Table I.

Emulsion type	anionic – non-ionic
Total solids, % by wt.	46-48
pH	8-9
Pounds per gallon, approx.	8.8
Particle size, microns	less than 1
Appearance	creamy
Odor	negligible

Table I. Characteristics of "Cyaqua" Emulsion 405-20.

Properties

Emulsion 405-20 has excellent tolerance for sodium borate (a test used to predict paint behavior over spackled surfaces). Emulsions made with non-ionics generally have better tolerance for inorganic salts than those made with the anionic type. It will be recalled that the difference in anionic, cationic, and non-ionic emulsifying agents is related to their behavior in water solution. Both the anionic and cationic agents ionize in water solution, but the non-ionic type does not ionize. . . . A typical example of each of the three types is: anionic, sodium oleate; cationic, lauryl ammonium acetate; non-ionic, glyceryl monolaurate[7].

Note that emulsion 405-20 is supplied at an alkaline pH.

A rough comparison of latices, alkyd emulsion and alkyd resin binders is shown in Table II.

"Cyaqua" emulsion is free from skinning. Each resin particle is protected from air by the continuous water phase. Skinning is a term used to describe premature coalescence of latex particles through loss of minimum water. Coagulation of the disperse phase of a thermoplastic latex occurs as a two-stage process. In the first stage, *flocculation*, the particles of the disperse phase form aggregates. In the second stage *coalescence*, each aggregate combines to form a single drop. This is an essentially irreversible process, leading to a decrease in the number of droplets and finally to complete demulsification[1].

Since this resin is more hydrophilic (prior to oxidation) than latex resin, it does not lose water rapidly enough from a closed bulk surface to form a skin. This means that storage and handling conditions are not critical, as with most latices. Consequently straining through wire mesh before use is usually not necessary. Despite claims of low odor for latex paints, users of this alkyd emulsion find a still lower odor level prevails.

The mechanical stability of thermoplastic latices may or may not be good. Mechanical working such as the rapid shearing of a paint mill may rupture the film of emulsifying agent, particularly if finely divided solids are present such as pigments or fillers[7].

Pigmentation

Pigments may be ground directly into "Cyaqua" emulsion without fear of breakdown. This feature has special merit when fully pigmented gloss enamels are prepared, thus allowing the product to have ample viscosity without resorting to gloss-detracting thickening agents. The emulsion, and in this

Binder Properties	Latex	Alkyd Emulsion	Solvent Alkyd
Skinning or crumbing	9	10	10-
Odor or toxic fumes	8	10	8
Mechanical stability	9	10	10
Good grinding liquid	8	10	10
Viscosity stability	10	10	9
Formulating accessories	9	10	10
High pigment loading	10-	10	10
Compatible with latices	—	10	—
Low temp. coalescence	9	10	—
Versatility of formulation	10	10	9
Freeze-thaw resistance	8-10	10	10
External Plasticizer required	8-10	10	10
Pigment compatibility	9-10	10	10

Table II. A comparison of latices, alkyd emulsions, and alkyd resin binders.

respect it parallels the alkyd resin, is capable of taking high pigment loading.

Grinding may be accomplished by any of the conventional paint grinding techniques, including the roller mill, provided enough binder is present. Higher pigment volume content (PVC) formulations are better handled on pebble mills, high speed stone mills or colloid mills. There is a minimum of foaming encountered.

Formulation

The formulation of latex paints usually requires a large assortment of accessories. Among these are pigment dispersants, wetting agents, deflocculating agents, stabilizers, thickeners, preservatives, anti-foaming agents and corrosion inhibitors.

Paints made from this alkyd emulsion generally require only some pine oil as an anti-foaming and flow agent and a little thickener. A preservative may be added as a precautionary measure because of the presence of the cellulosic thickener. We have found no evidence of bacterial decomposition in paints stored without preservative for more than three years.

The "Cyaqua" emulsion has been found compatible with a larger number of pigments than are acceptable with some latices which, for example, will not tolerate zinc oxide. Suitable prime pigments include titanium dioxide OR-540, zinc oxide, Cyan blue-green toner GT 55-3300, naphthol-scarlet toner 20-7511, Hansa yellow G 45-4050, Cyan green toner G 15-3100, ultramarine blue 59-4936, Pigment green B, red and yellow iron oxide and chrome oxide[8].

Preferred extender pigments include calcium carbonate, calcium silicate, diatomaceous silica, talc and clay.

Viscosity control is accomplished by the use of carboxymethyl cellulose, methyl cellulose, or polyacrylates such as polyacrylamide PAM-200. This last thickener may be adjusted with ammonia to pH 9.2. It dissolves readily in cold water to a 5% solution and is a highly efficient thickener with excellent pigment suspending properties[8].

Since paints made from this alkyd emulsion show little foaming tendency, a small amount of pine oil serves to decrease this tendency and to act as a leveling agent[8].

Tinting may be accomplished by the use of so-called universal pigment pastes. It is preferred to employ those not using casein. Casein or other protein is not required in paints made from "Cyaqua" emulsion. Thus, all possibility of putrefaction is eliminated, either in the can or on the wall.

The pH of the final paint should be held between 9.0-9.5. The differences in pH imparted by various pigments may be adjusted easily with a little ammonium hydroxide.

The properties of packaged paints are compared in Table III.

	Latex	Alkyd Emulsion	Solvent Alkyd
Stability	10	10	10
Settling	9	9	10-
Easy re-dispersion	10	10	9
Skinning or crumbing	10-	10	10-
Freeze-thaw resistance	8-10	10	10
Can rusting	9-10	10	10

Table III. Properties of packaged paint.

Application Properties

Paints made with "Cyaqua" emulsion have shown excellent stability both in shelf-life and in freeze-thaw resistance. There is some settling encountered in all water-dispersed paints; however, it is of a soft and readily dispersed type. There is no skinning or crumbing in the paints made from the emulsion. This is true even in partially used containers. Partly dried paint is readily re-dispersed if it should drop into the can during use. There is no evidence of can rusting in normal tinned paint cans.

The very important application properties of paints are compared in Table IV.

Paints made from "Cyaqua" emulsion will go on over any surface that can be painted with alkyd resin flat paint without sanding or special preparation.

All water-dispersed paints brush easily. However, paints made with this alkyd emulsion can be manipulated longer than latex paints. The alkyd resin emulsion paint is (until the resin has oxidized) re-dispersible. Therefore, fresh paint may be added to an area already coated, and brushed out without fear of lifting due to rapid coalescence. This property also reduces the hazard of brush clogging.

It is not generally necessary to keep a pail of water handy in which to soak spare brushes.

Lapping with paints made from "Cyaqua" emulsion is very satisfactory. Areas left several hours may be lapped without sheen or color variation.

The paints are non-sagging, but in common with latex paints do not level as well as an alkyd flat.

Foaming during application is not a problem. Paint rollers do an excellent job and the film is free from the craters caused by the breaking of persistent bubbles.

	Latex	Alkyd Emulsion	Solvent Alkyd
Surface compatibility	9	10	10
Low temperature coalescence	9-10	10	10
Brushing, ease	10	10	10
clogging	10-	10	10-
bristle softening	8	10	10
open time	8	8	10
Sagging	10	10	10-
Leveling	7	7	10
Roller application	10	10	10
Foaming	8-10	10	10
Odor or toxic vapors	9	9	9
Speed of re-coating	10-	10	9
Rapid drying	10	10	10
Lapping	10	10	10
Nail head corrosion	9-10	10	10
Easy water clean-up	10-	10	0
Wet vs. dry hiding	10-	10-	10
Self-lifting	9-10	10	10

Table IV. Application properties of paints.

Paints made from this alkyd emulsion dry fast.

Films may be re-coated in thirty minutes. Furthermore, there is apparently no self-lifting period.

The easy water clean-up associated with latex paints is one of their best virtues. Because of the nature of the paints made from "Cyaqua" emulsion (they develop good water resistance mainly by oxidation) spills and tools can be cleaned easily even though they may have dried many hours.

After oxidation has begun to polymerize the paint film, it may be cleaned off with mineral spirits or turpentine. Because of the high molecular weight and polarity of most latices, stronger solvents or abrasives are usually necessary to remove paint spots dried overnight.

There are only two properties of flat paint generally of interest to the consumer. "How easily does it go on?" and "How does it look?" The film properties of the various paint types are shown in Table V.

For a nice uniform dead flat effect the alkyd flat has been recognized as the best paint. Equally uniform dead flat effects can be attained with the emulsified alkyd. Also, superior color and sheen uniformity can be attained. Sheen uniformity is associated with nonpenetration and pigment wetting. Emulsions do not penetrate most paintable substrates. The adhesion of paints made from "Cyaqua" emulsion is comparable to the adhesion of paints made from alkyd resin. The resistance to water spotting is excellent (unless tinting colors having high concentrations of surfactants have been used).

Latex paints excel in hardness and ease of stain removal. The alkyd flat[6] and "Cyaqua" emulsion flat paints are not quite as good in these respects. However, resistance to burnishing, color stability and washability are all excellent. These results are a function of the pigmentation as well as of the binder.

Production Simplicity

Manufacture of paints with alkyd resin emulsion is very simple. Thirty gallons of light blue paint for sampling were made in a Kady mill in 15 minutes, without objectional foaming. In another plant 50 gallons of white paint were made on a 5 Roll mill in less time than was required to test the batch. Only eight basic ingredients are generally required: prime pigment, extender pigment, emulsion, drier, defoamer, thickener, water and ammonia. Of course, a fungicide may be added if desired.

Inventory problems are simplified since pigment dispersants, wetting agents, grinding aids, etc., are not required.

Examples of typical flat wall paint formulations are given in Tables VI and VII.

Formula No. 466 carries 2 lbs. of titanium dioxide per gallon and a PVC of 66%. It is a general purpose type flat white paint. Formula No. 465 is a lower cost formulation with a 1½ lbs. of titanium dioxide and a PVC of 74%. These formulations both brush easily and produce a uniform, pleasing dead flat finish.

	Latex	Alkyd Emulsion	Solvent Alkyd
Dead flat sheen	9	10	10
Sheen and color uniformity	10-	10	10-
Odor	9	10	9
Adhesion	8	10	10
Water spotting	8-10	10	10
Stain removal	10	10-	10-
Burnishing	10-	10	10
Color stability	8-10	9	10-
Flexibility	8	10	9
Washability	10	10	10
Hardness	10	10-	10

Table V. Film properties.

Weight, %	Ingredient	Lbs.	Gals.
10.35	Rutile titanium dioxide	148.5	4.35
30.74	Calcium carbonate, micronized	441.0	19.54
21.88	Calcium carbonate, low oil absorption	313.9	13.91
16.58	Cyaqua® emulsion 405-20	237.9	27.03
0.26	6% water dispersible cobalt drier	3.8	0.47
0.41	Pine oil	5.9	0.67
0.10	28% ammonia	1.5	0.18
7.60	Water	109.0	13.09
	Disperse in Pebble mill to fineness 3½ to 4 and add:		
8.56	3% water soluble cellulose solution	122.9	14.70
3.52	Water	50.5	6.06
100.00		1434.9	100.00

% Non. Vol. 71.5 — Viscosity Krebs Units 80-85 — Wt./Gal. Lbs. 14.3 — PVC 74.3%

Table VI. "Cyaqua" flat white paint formula #465.

Weight, %	Ingredient	Lbs.	Gals.
14.87	Rutile titanium dioxide	197.4	5.78
23.05	Calcium carbonate, micronized	305.8	13.55
16.36	Calcium carbonate, low oil absorption	217.1	9.62
20.53	Cyaqua® emulsion 405-20	272.5	30.97
0.32	6% water dispersible cobalt drier	4.2	0.53
0.29	Pine oil	3.9	0.45
0.11	28% ammonia	1.5	0.18
3.94	Water	52.3	6.28
	Disperse in Pebble mill to fineness 3½ to 4 and add:		
12.64	3% water soluble cellulose solution	167.8	20.07
7.89	Water	104.7	12.57
100.00		1327.2	100.00

% Non. Vol. 64.7 — Viscosity Krebs Units 78-84 — Wt./Gal. Lbs. 13.3 — PVC 66%

Table VII. Formula #466.

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SURFACE COATING VEHICLES WITH BUILT-IN FUNGISTATS

By
Leo A. Goldblatt, Lucien L. Hopper[1], Ruth Y. Mayne
Southern Regional Research Laboratory[2]
New Orleans, La.

ABSTRACT

A series of vehicles based on tung oil and containing chemically-combined, potentially fungistatic acids was prepared. Acids tested included propionic, undecylenic, and sorbic. The vehicles were subjected to a short-term laboratory test to determine fungistatic activity and some were formulated into paints. In the laboratory test some of the vehicles appeared to possess fungistatic activity. Yellow pine and mahogany panels coated with the experimental paints were exposed outdoors for 18 months. A tung oil-tripropionin paint formulation out-performed all others tested, including a high quality commercial paint. Vehicles with built-in fungistats merit further investigation.

THE importance of the problem of deterioration of protective films by microorganisms has been emphasized recently in a literature survey on the subject (1). The causative species of microorganisms, the substrates on which they grow, the source of contamination, fungicides in paints, and characteristics of resistant films all have been considered. Larson (4) has stated that "based on extensive tests, there is no mildewcide on the market today that will give satisfactory control of mildew in house paints." The value of proper formulations to carry chemical inhibitors and the value of correct atmospheric conditions during the time in which paint is applied were discussed by Klens and Lang (3) in another recent article. However, among this relatively large number of papers, there is no mention of the deliberate incorporation of an inhibiting agent as a chemically-combined part of the vehicle.

Tung oil, with its high proportion of conjugated unsaturation (it contains about 75 to 80% of eleostearic acid, 9, 11, 13- octadecatrienoic acid, as glyceride), may be considered as having more unsaturation than is required for rapid drying and as having the ability to dry in an almost excessive degree. In fact, tung oil is heat treated or modified with less unsaturated and nonconjugated oils such as soya bean oil, since films produced from raw tung oil tend to be frosted, owing to the excessively large proportion of conjugated unsaturation. The concept was developed of replacing some of the tung oil fatty acids, which gave it surplus drying capacity, with others which, although essentially nondrying, would impart other especially desirable properties. One such desirable property would be resistance to microorganisms.

A number of vehicles were prepared in which some of the tung oil fatty acids were replaced with acids which are potentially fungistatic, with a view toward developing a surface coating vehicle with a built-in fungistat. Replacement acids investigated included propionic, undecylenic, and sorbic acids, all of which are used industrially to prevent or retard microbial attack. Most of the vehicles prepared were of the epoxy ester type, but vehicles prepared by simple ester interchange of tung oil with tripropionin were also prepared. Some of the

1. Fellow of National Tung Research and Development League.
2. One of the laboratories of the Southern Utilization Research and Development Division, Agricultural Research Service, U. S. Department of Agriculture.

Lucien L. Hopper, Jr., Fellow of the Tung Research and Development League, applying paint vehicle to a panel for evaluation of its properties.

products thus obtained were tested for activity by a short-term laboratory method and some were formulated into paints and subjected to panel exposure tests. Such vehicles, containing active fungistats, would be permanently effective since the inhibiting component is combined chemically as part of the vehicle itself. Also, such formulations would eliminate the necessity of using toxic metals, such as mercury, which have obvious disadvantages for use in food processing plants, dairies, breweries, etc.

Experimental

In Table 1 are listed some representative vehicles subjected to a short-term laboratory test (5), together with significant data as to their composition and properties. These esters were prepared essentially according to a method described previously (2) for the preparation of epoxy resin esters containing tung oil fatty acids. A typical preparation is described below.

120 grams epoxy resin (Epon 1004), 40 grams tung oil fatty acids, 20 grams dehydrated castor oil fatty acids, 14 grams undecylenic acid, and 32 ml. xylene were charged to the reactor (a 1-liter, 3-necked flasked fitted with a Dean-Stark trap, thermometer, stirrer, and inlet for inert gas). The amount of xylene used was 15 ml. more than that required to fill the Dean-Stark trap. The mixture was then refluxed (temperature about 220°C) for about 2 hours at which time 3.6 ml. of water had collected in the trap and the acid number had decreased to a relatively low value (13.4). It was then cooled and thinned with xylene (200 ml.) to give a vehicle with 50% solids. In some cases a small amount of zinc resinate (½%) was used as a catalyst. This is indicated in Table 1. Also indicated in this table is the viscosity of the vehicle and the

Experimental tung vehicle being prepared in the laboratory by E. T. Rayner, chemist at the Southern Regional Research Laboratory.

drying time (Reichhold Drying Time Recorder) for a three mil film using the specified amounts of cobalt (as cobalt naphthenate) drier.

The tung oil-tripropionin vehicle, also listed in Table 1, was prepared by ester interchange. 180 grams tung oil, 20 grams tripropionin, 1 gram zinc resinate (ester interchange catalyst), 2 grams phenolic resin VBR 810 (for gasproofing), and 32 ml. xylene were charged to the reactor described previously and the mixture refluxed for 1-½

Table I. Composition and some properties of vehicles used in short-term laboratory tests.

Vehicle	Composition (grams)					Vehicle at 50% solids		Dry (3 mil. film with Co.)	
	Epon 1004	Tung oil fatty acids	Dehydrated castor fatty acids	Fungistatic acids	Zinc resinate	Viscosity	Acid value	% Cobalt	Hours
A	120	—	80	—	—	G-H	4	.06	2¼
B[1]	120	—	80	—	—			.04	2¼
C[2]	120	—	80	—	—			.04	1½
D	120	—	80	—	1	H-I	2	.02	1½
E	120	40	40	—	—	X-Y	3	.03	1½
F	120	40	40	—	1	Y-Z	2	.02	1
G	120	40	20	Undecylenic (14)	—	V-W	7	.01	2½
H	120	40	20	Undecylenic (14)	1	V-W	6	.02	1¼
I	120	40	21	Undecanoic (14)	—	V-W	7	.02	1
J	120	40	20	Sorbic (6)	—	Z-4	10	.01	3½
K	120	40	10	Propionic (6)	—	U-V	10	.01	3½
L	120	40	10	Propionic (6)	1	Y-Z	7	.01	2½
M	120	40	—	Propionic (9)	—	V-W	7	.02	5
N[3]	—	Tung oil (180)	—	Tripropionin (20)	1	X-Y	—	.05	2¾

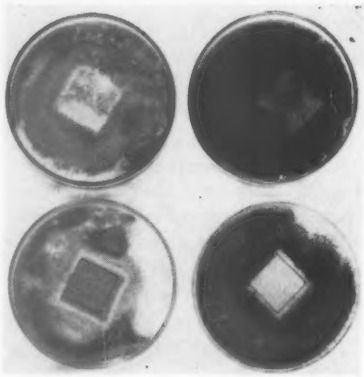
1 With 0.2 g. G-4 (bis[5-chloro-2-hydroxyphenyl]methane) added to 3 liq. oz.
2 With 1 g. p-toluenesulfonamide added to 3 liq. oz.
3 With 2 g. phenolic resin VBR 810.

hours, at a temperature of about 220°C. Approximately 0.35 ml. water was evolved. The product obtained was essentially neutral and had a viscosity X-Y on the Gardner-Holdt scale.

The short-term laboratory method adopted to test the fungistatic activity of these vehicles was that of the U. S. Army Corps of Engineers Research and Development Laboratories (5). In essence the technique was as follows: Whatman filter was coated on both sides with the test vehicle, which was allowed to dry 48 hours; the paper was then cut into 1-¼ inch squares, and ruled on all sides 1/8 inch from the edge with India ink. Each square was placed on a petri dish of the specified nutrient agar; and the paper and agar were subsquently inoculated with a suspension of spores of the test organism. Three replicate plates were used for each of the two test organisms, which were *Aspergillus niger* (ATCC #10535) and *A. oryzae* (ATCC #10196). The inoculated plates were incubated at 28 to 30°C. in a relative humidity of 80 to 90%, and results were recorded after 7 and 10 days. The growth was estimated numerically according to the following key, and the results of three replicate plates were averaged:

1. No mold growth on any portion of the sample within the guide lines. Growth up to the guide lines is disregarded.
2. Slight mold growth on any portion of the sample within the guide lines.
3. Moderate mold growth on any portion of the sample within the guide lines.
4. Heavy mold growth on any portion of the sample within the guide lines.

A tung-tripropionin vehicle was formulated into a white paint and subjected to a limited scale outdoor exposure test as a paint vehicle. For this yellow pine siding (3′ x 6″ x ½″) and Philippine mahogany panels (2′ x 5-½″ x ¾″) were used. All the panels were given a prime coat of a high quality, nationally advertised base coat paint applied at roughly 600 square feet per gallon coverage. The control panels (in duplicate) were given a second coat with a similar high quality



Short-term laboratory test showing a control and a fungistatic vehicle. Upper plates inoculated with *Aspergillus niger*; lower ones with *A. oryzae*. Plates on left contain control. Plates on right contain fungistatic vehicle of epoxy resin tung oil fatty acids and sorbic acid. The white areas on lower control are fluffy mold mycelia with few spores.

leaded-zinc oxide-titanium pigmented white paint at 450-500 square feet per gallon coverage; the other panels were given a second coat using the experimental paints. These were made on a laboratory roller mill using the same pigmentation. No attempt was made to determine the optimum pigment-volume-concentration for the experimental vehicles.

The panels were exposed facing south at a 45° angle on the grounds of the Southern Regional Research Laboratory, which is close to Lake Pontchartrain in New Orleans. Annual average atmospheric conditions are as follows: rainfall 57.46 inches, relative humidity 72, maximum temperature 77°F., minimum temperature 62.2° F.

Results

The results obtained from the short-term laboratory test are summarized in Table 2. It will be observed that five of the samples definitely showed better fungistatic action than the others, giving values of 2.0 or below after 10 days for both organisms. These five were vehicles containing sorbic acid, propionic acid, tripropionin, and the controls containing tung oil fatty acids. It was disturbing to find that the controls inhibited growth of the molds as well as the test samples and this makes interpretation difficult. Also, the vehicles containing the known fungistats G-4 (bis[5-chloro-2-hydroxyphenyl]-methane) and p-toluene sulfonamide did not inhibit growth. Klens and Lang (3) have pointed out that unless paint is soundly formulated, fungicides will not protect it against most growth.

The panels subjected to the outdoor exposure test were examined from time to time. After 12 months the control panels and the panels coated with the paint made using an interesterified tung oil-propionin formulation (85% tung oil, 15% tripropionin) were both in excellent condition. There was no evidence of mildew, dust retention, or failure by cracking, flaking, or blistering. Moreover, some test panels coated with other formulations, and exposed at the same time, showed definite evidence of

(*Turn to page 85*)

Table II. Growth of molds on test vehicles*.

Vehicle	Aspergillus oryzae		Aspergillus niger	
	In 7 days	In 10 days	In 7 days	In 10 days
A	2.6	3.0	3.3	3.7
B	2.0	2.2	3.0	3.6
C	2.1	2.2	3.0	3.3
D	2.6	2.6	3.0	3.6
E	1.3	1.4	1.2	1.2
F	2.0	2.0	1.6	1.6
G	2.1	2.4	3.0	3.0
H	2.0	2.0	2.6	2.6
I	2.0	2.1	3.0	3.6
J	1.1	1.1	1.2	1.2
K	2.2	2.2	2.2	2.4
L	1.2	1.4	1.2	1.2
M	2.0	2.0	2.2	2.2
N	1.2	2.0	1.2	1.2

*No mold growth within guide lines (1.0); slight growth within guide lines (2.0); moderate growth within guide lines (3.0); heavy growth within guide lines (4.0). Readings are average of 3 plates.

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Solvent	Xylene	"Cello-solve"	Xylene	Methyl Isobutyl Ketone: Xylene 65:35	"Cello-solve": Xylene 3:1	Toluene	Methyl Isobutyl Ketone	"Cello-solve" Acetate: Toluene 1:1
G.H. Viscosity	Z3-Z5	Z3-Z5	Z4-Z6	Z1-Z4	Z5-Z7	Z2-Z4	W-Z	Z1-Z4
Color (Gardner Std '53)	5 max.	5 max.	6 max.	5 max.	5 max.	5 max.	5 max.	5 max.

*% Non-Volatile ± 1.0%

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By
Phil Heiberger

The author continues his random reflections on various aspects of the paint industry. The opinions expressed in this column are his alone and do not necessarily reflect those of this publication.

Recreation in a Changing Society

There was a time when recreation and play were thought of as things for children—children and a handful of wealthy bank presidents, business executives, and playboys. Nowadays it is fairly well recognized that recreation and play are for everybody—young and old, and rich and poor. Moreover, there's another surprising development. Executives and high-income specialists who could well afford to splurge on entertainment are finding that they are so busy with tasks arising from their numerous responsibilities that they work longer hours than most other people. At the same time, children, traditionally carefree, are beginning to feel the impact of the current clamor for "toughening up" of their school work. Even their summer-long holiday is giving way to newer and more rigorous year-round schedules in some communities. The strangest part of these changes is that they are taking place during a period in history when the conventional work week is becoming progressively shorter and the working man has an unprecedented number of "free" hours.

P. Heiberger

There was a time when over-long hours, subsistence wages, and unpleasant conditions led to the concept of work as an abhorrent activity. Those who did not have to scratch for a living were considered lucky. The man who could retire with a pension and secure knowledge that he never need work again was believed most fortunate. Here, too, there's been a change of heart. Nowadays, many who retire do so unwillingly, and pressure is being exerted to reverse the formerly favored early-retirement trend. We now know that work is vitally important for physical and mental health, and that those who shun it completely do so at their own peril. A non-worker does not contribute to his own welfare or to that of his society. He is robbed of the satisfaction of accomplishment and achievement and is therefore unhappy.

Down with Dichotomy

It is clear, now, that the old dichotomy of work vs. play was an illusion, not a reality. There is no true, sharp distinction, no clear-cut difference between the two. There are many pleasurable aspects to work and there is much enjoyment to be derived from engagement in serious pursuits during leisure hours. Not only is there a recognition that every human being needs both work and play to make a healthy, well-balanced and happy life, but there seems to be more and more of an over-lapping of the two, so that it is not always readily apparent whether a man is working or relaxing just by observation of his activity. Some men "play" baseball for a livelihood while others paint their houses during "non-working" hours as a means of "unwinding" and throwing off the tensions of the day. Attitude is the most crucial factor. There are some implications for the paint industry here that might be worth exploring.

Leisure and Efficiency

Paul Alpert, a French economist with the U. N. Trusteeship Division, made several noteworthy observations about American patterns of living in the November 1958 issue of *Challenge* magazine. In his article, "The Inefficiency of Leisure," he talks about the paradox of suburban husbands "returning to the ease of air-conditioned offices after a backbreaking weekend of do-it-yourself." Alpert points out that the very increase in productivity that has given us higher wages, a better standard of living, shorter working hours, and more leisure time, has also increased the cost of services (such as home maintenance, repair and improvement) to the point where the majority of homeowners prefer to perform these services for themselves.

In the early days of this country, most men had to do everything connected with upkeep and improvement of the home, including chopping down the trees and building the house itself. To a large extent, each family was an independent economic unit and had little choice about performing these tasks. The industrial revolution changed all that. At first, each person spent so many hours engaged in his particular trade that there was no time available for home service jobs. Furthermore, many of these jobs required specialized tools and skilled workmanship. However, the very same technological improvements that increased production efficiency and reduced the number of working hours also simplified home repair by factory performance of preliminary parts of the tasks. Pre-

cut, easily handled asphalt tile and ready-mixed paint are obvious examples. Thus, the time saved from on-the-job working hours became available for home tasks which could now be handled with comparative ease. We have now arrived at the stage where men *choose* to do (sometimes to save money; sometimes to fill in uncomfortably large blocs of free time and to discharge excess energy) what formerly they *had* to do.

Mr. Alpert, along with other commentators, considers this a desirable situation because it means that the American family regains the benefits of 'togetherness" which it lost when the family unit was deprived of its role as producer.

Painting for Recreation

While *Changing Times* has jestingly defined leisure as "the time you spend on jobs you don't get paid for," it is a fact to be reckoned with that painting, along with many other household chores, has been reclassified in the minds of many from a "work" activity to a recreational outlet. As such, it competes with other forms of recreation for the spare time and money of the consumer. Although it is customary for members of the paint industry to emphasize the protective as well as the decorative aspects of trade sales paints, it is true that while the living room will not be as pleasant to look at if it is not repainted every two or three years, nevertheless there's no reason to believe that the walls will come "a tumbling down." It is not surprising, then, to observe that a large part of the sales effort is now directed to the amateur painter, the homeowner and ultimate consumer. Home painting, an integral part of interior decoration, takes its place alongside music, art, landscaping, poetry, and needlework as forms of expression that enrich life and make it more enjoyable. The advertisers who picture a happy family all decked out in fashionable playclothes wearing ear-to-ear smiles as they repaint the living room one jolly afternoon before a gay party they plan to give the same night might be exaggerating slightly, but essentially they are on the right track.

The Recreation Profession

Apparently the advertisers are fully aware of the appeal and importance of "opportunities for satisfying use of expanding leisure time," a favorite phrase of leaders in the field of recreation. Until recently, when a copy of *Recreation* magazine happened to come my way, I had not realized the scope and extent of the recreational field, nor had I given very much thought to how the paint industry and the current "do-it-yourself" craze fit into the cultural pattern.

It came as a surprise to learn that there are over 50 colleges and universities offering recreation education for future professional recreation leaders and that both undergraduate and graduate degrees are awarded. In addition to the National Recreation Association (established in 1906), a professional organization which publishes *Recreation* magazine, there is a national lay organization, the American Recreation Society. Also, there are state and local societies. According to an article in the November 1957 issue of *Recreation*, which I quote, "already recreation leadership and administration is undergoing functional specialization. Areas, such as public community recreation, park administration, forest administration, hospital recreation, mental hospital recreation, welfare agency recreation, church recreation, recreation in penal institutions, tourism recreation, commercial recreation and private club recreation are already developing special fields of activity. Especially in hospital recreation a theoretical foundation and effective therapeutical experience are being demonstrated."

Recreation, obviously, is a serious professional concern for many people. One thing that really worries the experts is the prospect of continued increase in leisure time for a large segment of the population. The stumbling block is the "habit lag," which means a clinging to outmoded habits of life when changed conditions dictate the formation of new habits. Unless the habit lag is revolutionized and people learn to use their increased leisure meaningfully so that their experiences are rewarding, the 1960's will find an even larger amount of mental illness than ever before. Recreation leaders are trying to prevent such an eventuality.

Although some people still think of recreation as merely "unhurried pleasurable living," there are many who stress the "quickened spirits" and the possibility of personal satisfaction. "The ancient Greeks," states Harold W. Williams, in the November 1957 *Recreation*, had a definition for happiness which went as follows: 'The exercise of vital powers along lines of excellence in a life affording them scope.' "

"The life spirit which makes man what he is has its roots in four quests:" Mr. Williams goes on to say, "the search for truth, the attempt to create, discover and enjoy beauty; the pursuit of goodness; and the seeking of fellowship with other men. As we strive toward these goals, we become men more and animals less. When we neglect them we lose out humanity and our civilization begins to merge with the so-called lower forms of life." The second and fourth of these quests are embodied in the idyllic picture mentioned earlier of the happy family cooperating in the painting of their living room. The appeal of the picture needs no explanation. By selling color, taking the unpleasant odor out of the paint, reducing drying time, and simplifying clean-up operations, the paint manufacturer actually helps in making the leisure "job you don't get paid for" a real pleasure.

Undeniably, do-it-yourself (which includes house painting) is an important item in the long list of competing recreational activities, and like sports, games, automobile travel, a trip to Europe, charity work, gardening, music, dancing, art, library usuage, discussion groups, nature walks, camping, education, and other pastimes that could be mentioned, it offers its own special delights and rewards.

It's time that members of the paint industry recognize the value of their own occupation. Recreation and pleasure are not synonymous with frivolity and superfluity. They are an integral part of the good life. To the man who does it himself, paint gives pleasure two ways: there's fun in the doing and satisfaction in surveying the results of the deed.

Another packaging advance by Continental

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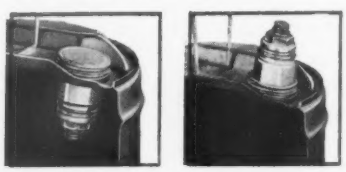

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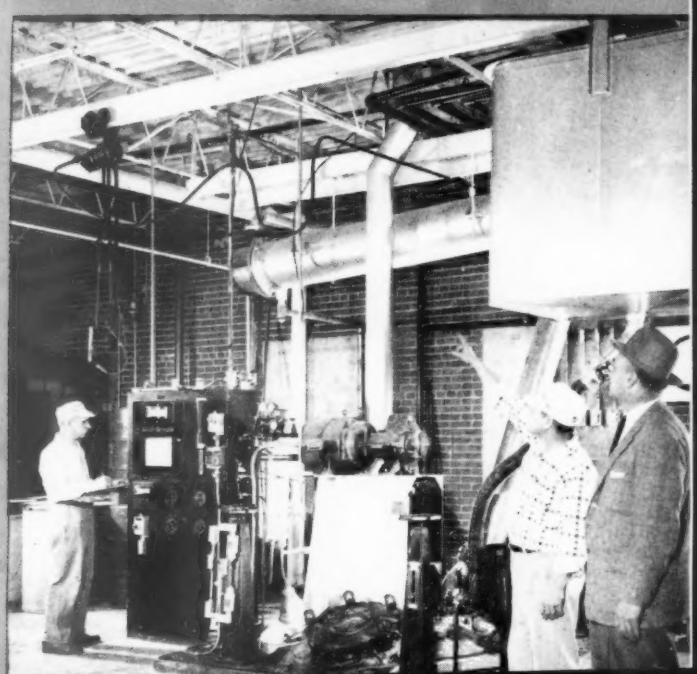
PRODUCTION

PACKAGING

MATERIAL HANDLING

NEW EQUIPMENT and MATERIALS

To obtain uniform batches, The Grand Rapids Corp. finds Dowtherm quite adaptable for cooking varnishes and resins on a large scale. For details of this process, see page 53.



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di-isooctyl phthalate (DIOP)
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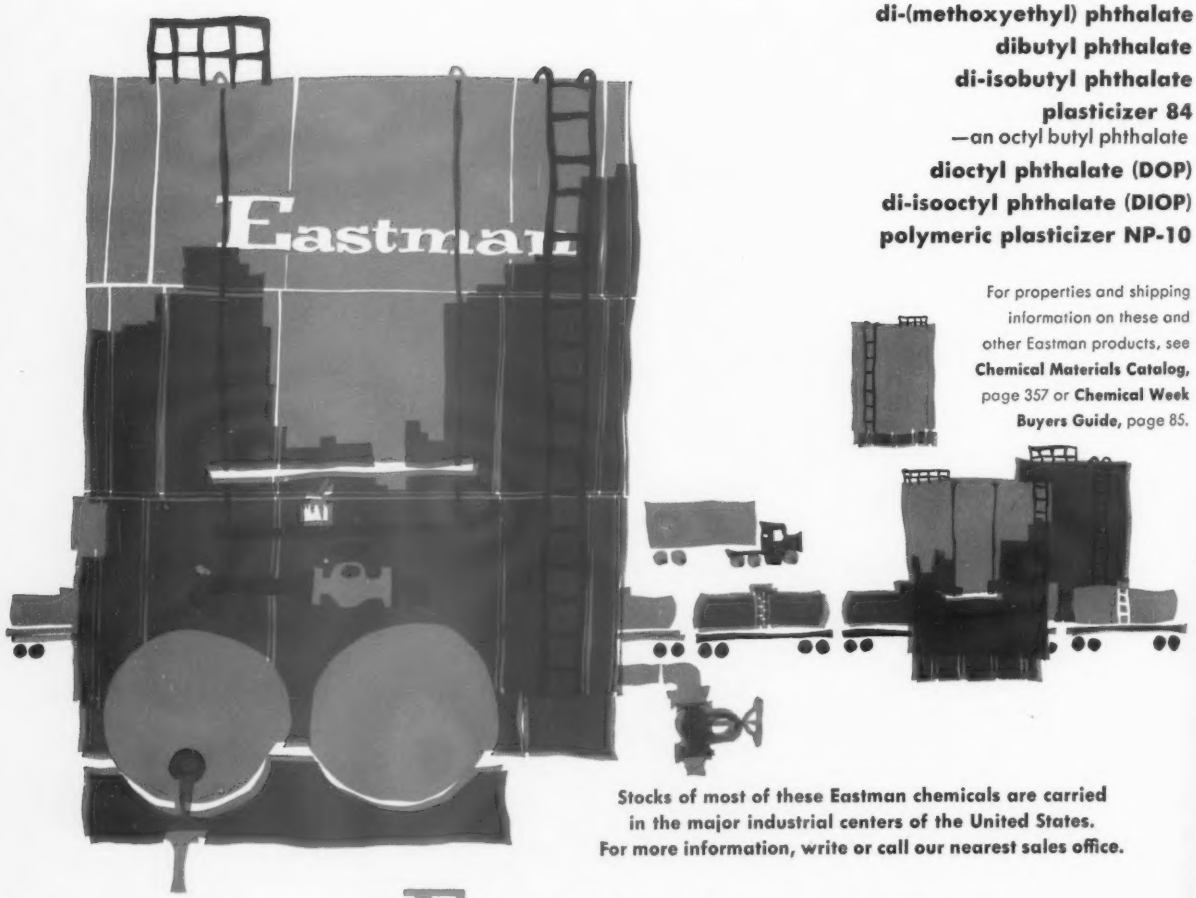

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DOWTHERM FOR HEAT TRANSFER

Provides uniform and safe heat in varnish and resin cooks

SHORT-order cooks, homemakers and week-end chefs occasionally scorch the fried eggs, curdle the milk or boil a pan dry. They are victims of improper techniques, accented by non-uniform heat transfer conditions.

The same tendencies towards product degradation harassed the paint industry in its earlier days, too, because existing methods for cooking varnishes, oils and resins often caused "spot" overheating. Only here lessons learned were much more expensive than those in the kitchen.

When production volume was relatively low, problems caused by heating could be quite well controlled. But, as the paint industry expanded and demands were made for large capacity kettles for processing hundreds of formulations, new, safer and better methods of heat transfer were sought.

In addition, quality control remained as important as before and competition dictated that the highest quality be maintained at the least possible cost.

The Sherwin-Williams Co., The Grand Rapids Varnish Corporation and other major paint manufacturers led the way. Testing proposed heat transfer media, they found that new vapor phase or liquid phase systems using a new chemical formulation, Dowtherm A (Dow mixture of diphenyl and diphenyl oxide for heat transfer media), were very satisfactory.

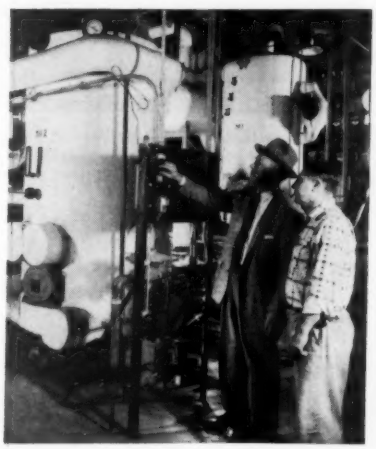
Heat transfer is as old as fire itself. After man learned how to make fire, he used an open flame to warm his kettle of food. Then came steam and finally chemical heat transfer for mass production of food and other products.

Originally, all equipment was fired directly by primitive methods. About the fifteenth century, the revolutionary idea was conceived of separating the fire from the equipment and using steam as a heat transfer medium to bridge this gap. Steam worked satisfactorily on low-temperature jobs but when it was applied to high-temperature processing, the pressure required made the equipment elaborate and costly.

Process engineers sought a system that would permit uniform heating at high temperatures but with low pressures. This has been achieved by vapor or liquid processes. Used in these systems, Dowtherm A provides fraction-of-a-degree temperature control, uniformity of temperature, low pressures and high rates of heat transfer in equipment.

Properties

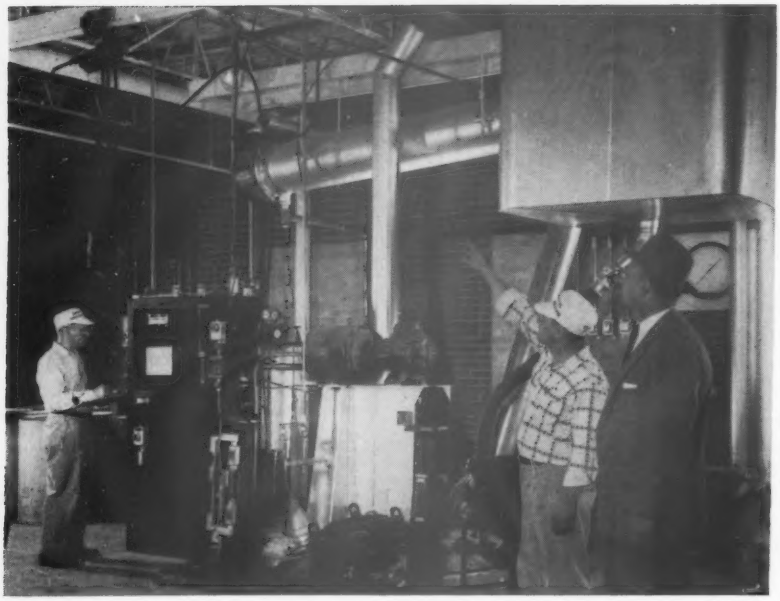
At room temperature, Dowtherm A is a clear, non-viscous liquid with a rose-geranium odor. This quickly-identified odor serves as a highly practical leak detector. At its freezing point of 53.6 degrees F., it contracts slightly, thereby removing the possibility of damage to process equipment which is shut down under cold weather conditions. The normal practical vapor working range for Dowtherm A is between 500 degrees F., and 750 degrees F. Any desired vapor temperature in this range may be held constant by setting the operating pressure.



Instrument panel with heat exchanger (boiler) just behind panel.

Dowtherm A liquid is converted to vapor in a vaporizer in the same way that water is converted to steam in a boiler. Here the comparison ends, for while steam at 700 degrees F., exerts a pressure of over 3,000 psi, Dowtherm A at this temperature exerts a pressure of only 95 psi. This lower pressure permits the use of less expensive, thinner shelled equipment which also requires less space. The hazards of high-pressure equipment are also avoided, and many designs which cannot be fabricated to withstand steam pressure are made usable.

A typical heating system employing Dowtherm includes a vaporizer, process equipment, controls and accessories. Natural circulation is often possible in this operation. The vapor rises from the generator through the process equipment and there condenses to flow back to the vaporizer by gravity. Thus, the system is entirely automatic, closed, and contains no moving parts.



Instrumentation is important in production of quality varnishes, oils and resins. Instrument panel for this equipment is in background. Top of cooking kettle is shown just above floor in center of photo.

Where there is insufficient difference in elevation to operate this system, a pump can easily be made a part of the system to return the condensate to the vaporizer.

The paint and varnish industry uses the three heat transfer systems of direct fire, liquid phase and vapor phase to heat the resins and drying oils. The latter two systems can utilize Dowtherm A. When a vapor or liquid medium is used for heating, the liquid medium may be used for cooling the product in the kettle. Many companies now have facilities for two or all three systems as their plants have been expanded or modernized.

Direct Fire

The direct fire method of heat transfer is the oldest known for processing varnishes and some resins. The required equipment is relatively simple to design and build, and its operation is normally uncomplicated. If the product being processed is heat-sensitive or flammable, however, the design problem can become very complicated.

Generally, the fire must be located directly beneath the vessel being heated. But this combination of a primary heat source with the processing equipment can lead to inefficient units which are difficult to control.

The equipment must necessarily be located well away from other flammable material in a plant and this often means inefficiency. Also, the time required to heat or cool the furnace setting makes it difficult to obtain the rapid changes in temperature required for truly precise heat control.

Perhaps the major difficulty with direct fire is the probability that the flame, transmitting much of its heat by radiation, will cause local overheating. This may cause thermal degradation—resulting in a non-uniform, off-color product, adding to the difficulty of cleaning the processing equipment between batches.

Vapor or Liquid Phase

When the newer vapor phase or liquid phase systems are installed, the cooking kettles are well-insulated units jacketed for Dowtherm liquid or vapor. Kettles may range from 500 to 8,000 gallon capacity. The raw materials are introduced and are heated to the desired temperatures with Dowtherm A.

With good agitation and temperature control as given with this product, the material is brought up to temperature quickly and also there is comparatively no carbonization. Also, the fire hazard as encountered with handling flammable solvents in the direct fire method is greatly reduced.

The resins are cooked to the desired degree of polymerization and before they are discharged into the thinning tank, the resin is cooled by circulating cool liquid Dowtherm through the same jacket or coils previously used for heating.

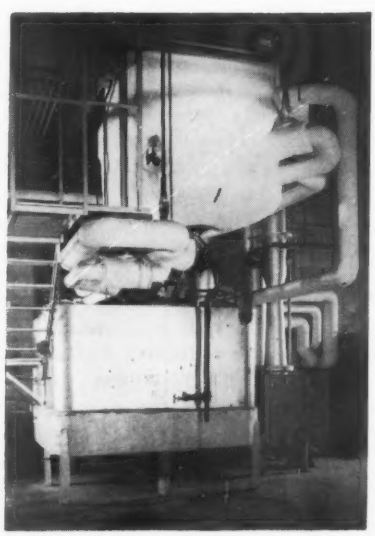
With Dowtherm, it is possible to produce uniform batches. Kettle life is increased and cleaning is either eliminated or made easier.

Case Histories

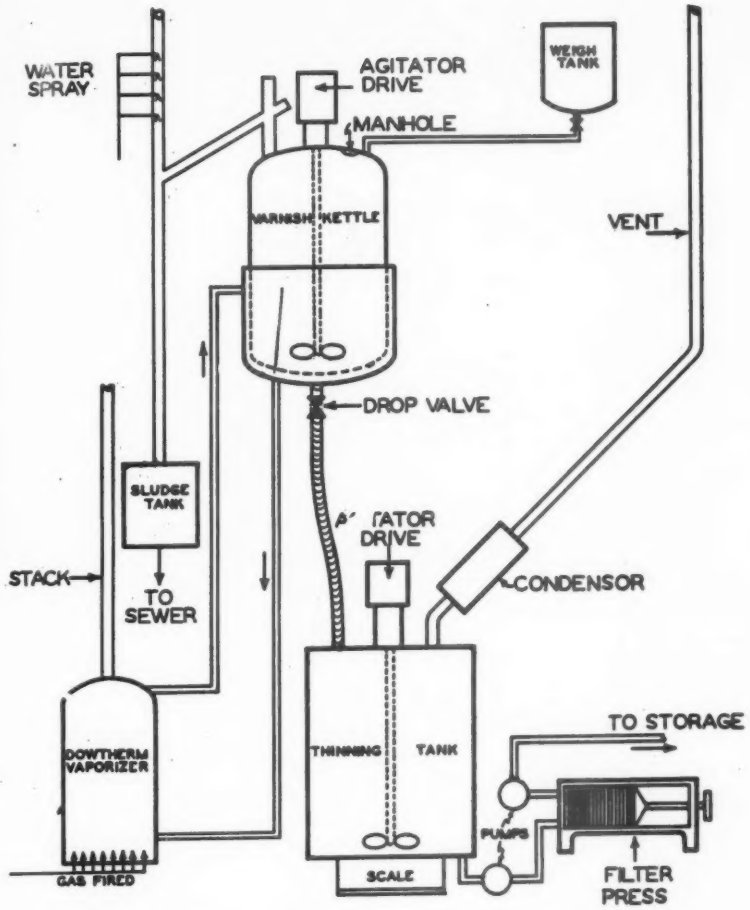
The Sherwin-Williams Co., has installed vapor phase systems using Dowtherm in seven plants in the United States as well as plants in foreign countries. At Chicago, it also has direct fire production for small batches or odd lots, which are holdovers from its earliest units.

The Grand Rapids Varnish Corporation in Michigan, on the other hand, has no direct fire units but has kettles functioning on both vapor and liquid phase systems using Dowtherm A. This firm's management has observed that the liquid phase system permits both high and low temperature cooking while the vapor phase system is well adapted to high temperature cooking, only.

In the Chicago, Varnish and Resin Department of Sherwin-Williams, 75 per cent of production is accomplished with seven systems serving nine kettles. Varnish and



Lower part of cooking kettle for varnish resins visible as it emerges form ceiling at the Grand Rapids Varnish plant. This company uses liquid and vapor phase heat transfer system employing Dowtherm A.



Schematic diagram of varnish-resin process using Dowtherm.

resins are cooked from eight to twenty-four hours, depending upon the end product, in kettles ranging in size from 500 to 4,000 gallons. Each heat exchanger operating single kettles is rated at 1,000,000 BTU per hour while those handling double units are each 2,500,000 BTU.

Temperatures are elevated to 550 degrees F., yet the pressure per square inch is only 16 pounds gauge instead of pressures over 1,000 pounds per square inch if steam was used. Liquid Dowtherm A also is injected as a coolant around the jacketed kettle when the product must be cooled during cooking operations to permit additions of ingredients or when the completely cooked product is cooled down to between 200 and 400 degrees F., before being thinned.

After cooking, resins may be thinned, the impurities removed and then the finished product is stored. This material is added to paint or sold as varnish. Over a period of time, The Sherwin-Williams Co. runs some 700 formulations in the nine Chicago units utilizing Dowtherm A.

This company has eight direct fire units where previously there were sixteen. Though direct fire cooking time is the same as with the vapor phase system, only smaller kettles holding between 200 and 500 gallons of materials can be used because of fire possibilities. Therefore, with the same process time, three to six times more varnish or resins can be processed using the vapor phase system.

Other advantages of the vapor phase system over direct fire exist, according to the superintendent of the Varnish Resin Department in Chicago. There are fewer fires, better product control and better color because of heat uniformity. Only about one-half the manpower is needed since the vapor phase system is fully automatic while employees must manually move kettles over the direct fire and watch the operations closely.

The Sherwin-Williams Co. employs both vertical fire-tube and liquid tube vaporizers, all of which are gas-fired. Vaporizers may also be oil-fired depending on fuel costs in a particular area. Many companies used forced circulation heaters as well as natural circulation vaporizers.

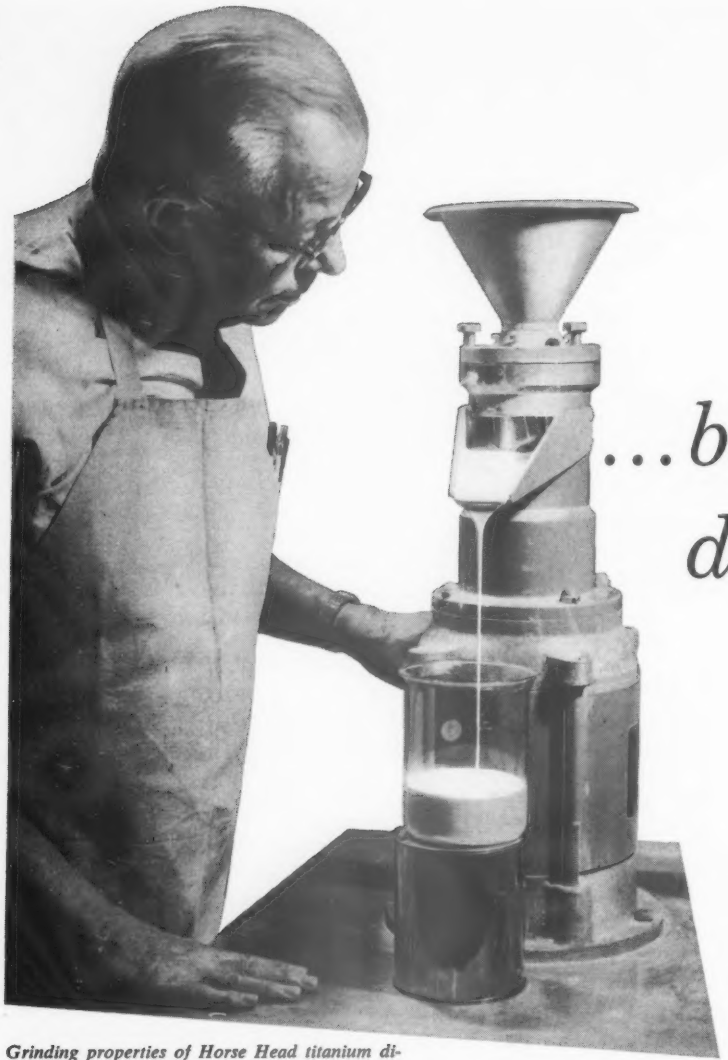
Dr. George Lindemulder and other technical personnel at Grand Rapids Varnish Corporation, believe they have one of the most complete heat transfer systems in the industry. The company has no direct fire units but has kettles functioning on both vapor phase and liquid phase systems. Facilities for both systems give the firm considerably more product versatility than with just one of these systems.

Dowtherm A is used in both cases. When temperatures in the range of 440 to 560 degrees F. are required, either the vapor system or the liquid system may be used. When temperatures in the range of 150 to 300 degrees F. are desired for certain products, the liquid system is utilized.

The original production reactor, installed in 1941, is operated with the vapor system only. A new kettle that went on stream earlier this year is designed for the liquid system only. In addition, there is a 250-gallon pilot kettle which is adapted to both vapor and liquid phase methods. Two vaporizers serve the three units. One is rated at 1,400,000 BTU per hour and the other at 1,000,000 BTU per hour.

The Grand Rapids Varnish Corporation makes processed oils, varnishes, alkyd resins, maleic resins, ureas, melamines, polyesters and polyurethanes. Liquid phase heat transfer is employed for the ureas, melamines, polyesters and polyurethanes.

Though the homemaker and the professional cook have not solved all of their heat transfer problems, paint and varnish manufacturers are obtaining uniform products at lower costs with greatly reduced fire hazards. The Sherwin-Williams Co., Grand Rapids Varnish Corp., and many other companies now accept Dowtherm as their heat transfer material.



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PROFIT SHARING

By
Lawrence Shatkin

IN the past twenty-five years, companies have devoted most of their energies to technological innovations as a means for survival. In the future, those corporations that have withstood the movements of the business cycle will devote the larger share of their energies to human problems.

The attitude of the man on the bench is regarded as of greater importance in accomplishing the objectives of an organization. It will be the course to greater productivity and maximum efficiency.

There are a number of management-labor plans in existence today, which strive toward greater output and increased earnings. Profit-sharing is an area which has been largely neglected. It has made a small dent in the American economy, because it follows very closely the cyclical movements of the business economy. Nevertheless, it has been used very sucessfully over a long period of time by such corporations as Proctor and Gamble, Eastman Kodak, and Sears, Roebuck and Company.

Definition

The International Congress on Profit Sharing declared profit sharing to be an "agreement freely entered into, by which the employees receive a share, fixed in advance, of the profits." The share received is dependent upon the resulting profits, and means for calculating the profits should be agreed upon in advance. Profit sharing is not to be confused with production bonuses, incentive wage payments, and pension plans.

A Philosophy of Profit Sharing

In considering the adoption of such a plan, it is necessary that certain fundamental thoughts be present in the minds of management. It is essential to recognize the dignity of mankind, and the belief that labor's contribution entitles it to a reward. The grouping of all these forces must be directed to the consumer, who will determine the success of any plan.

Profit sharing is not a solution to your problems. It is a device that will lead to a better understanding of people. This philosophy becomes part of your every-day thinking.

Production Incentive

An increase in production efficiency may be accomplished through increasing output, reducing costs, or both. This is one of the more important ways in which management anticipates that the plan will pay for itself. It is hoped that a "esprit de corps" will be created, which will encourage teamwork, and a consciousness toward reducing waste and means of avoiding it. The production incentive aspects of profit sharing are often the primary reason for the installation of profit sharing in smaller companies.

Other Purposes

Profit sharing may serve as a device for interesting workers in company problems, so that they may be more effectively educated in the American system of the business enterprise. It is necessary that employees understand the nature of profits, the profit motive, and the possibility of non-profit periods under the plan. The approach to educating the employee about profits can be obtained through group meetings of employees, through the line supervisor's daily contacts, or by means of distributing various kinds of written material concerning the subject.

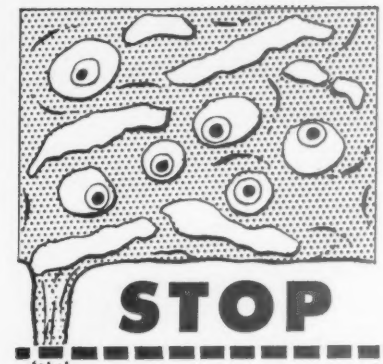
Approximately seventy-five percent of profit sharing firms indicate that they go beyond the sharing of profits to indicate the partnership idea. The two most commonly used methods for augmenting this alliance are the issuance of financial reports to employees and the distribution of various types of company progress information.

The weak link of many profit sharing plans is the possibility of a non-profit year. This probability has to be counteracted by a preponderance of profitable years, especially soon after the inception of the plan. Data suggest that if a company could weather the first few years of the plan, a non-profit period would be taken in stride.

Some advocates of profit sharing plans stress the fact that it affords a means of keeping labor costs flexible. This is especially true during a recession when high fixed wages are very difficult to cut back.

Other objectives of profit sharing plans include: the desire to provide security for employees, improvement in employee morale, decreasing labor turnover, stimulate employee saving, improving public relations by making known that a company believes in sharing with employees, preventing unionization of the company, preventing strikes, and discouraging governmental regulation of labor relations.

The opinions expressed in this feature are not necessarily those of any particular firm or organization.



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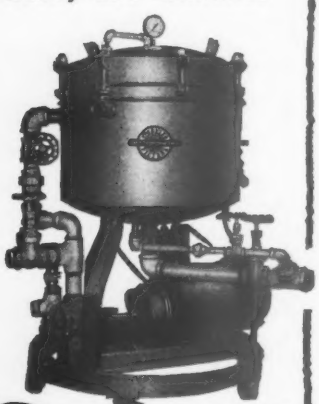


Model 18-S-12
Varnish Filter
(steam jacketed)

SPARKLER horizontal plate FILTERS

Our engineers will give personal service to your problems.

SPARKLER MFG. COMPANY
Mundelein, Ill.

Objections

Some of the objections to profit sharing plans include: poor incentive, morale depressant, poor security measure, limited to concerns having stable profits, profit sharing should not include the worker, and high mortality rate of profit sharing plans.

One of the major reasons for employee dissatisfaction with plans which have proven unsuccessful has been lack of understanding of the principle involved and inability to fully comprehend the influence of the business cycle upon profits.

Economic Need for Profit Sharing

During an inflationary period, which the economy has experienced during the last decade, high costs have pushed the "break-even" point to a position whereby most companies depend upon large volumes to make a profit.

All profit sharing plans have one aim, namely, to consolidate, fortify, and vitalize the single productive unit into a cohesive force made up of management and labor. The material advantage an employee obtains is an improvement in the general level of efficiency and a reduction in waste. If workers consider themselves to be partners in the business, they will be much more interested in increasing its profitableness, in seeing that a fair day's work is done by everyone, and in reducing scrap losses. This has been proven by the records of concerns with well operated plans. These firms have increased returns to the stockholders, despite the sharing of profits.

Types of Plans

There are three kinds of plans: the current distribution plan, the deferred plan, and the combination plan.

The first type is commonly referred to as the cash plan. Under the deferred payment type of profit sharing plan, the profit shares are paid to a trust fund rather than directly to the worker. The empolyee receives this when he becomes eligible. They are usually made when he retires, when he becomes permanently disabled, or when he terminates his employment with the organization.

In small companies (less than 100 employees) the cash plans outnumber the deferred plan over two to one. There is a tendency for the larger concerns to utilize the deferred distribution plan. Quite frequently the objective of the deferred type is to create and maintain employee security, whereas the current plan is that of increasing incentives.

There seems to be some relationship between size of company and type of plan, and year of initiation and type of plan. Most of the deferred plans were started during World War II and are more prevalent among the larger firms. These plans were primarily introduced by management with very little participation on the part of employees and none on the part of the union.

The current plan type has greater potential both for stimulating increased effort during profitless periods and for causing resentment and production decreases. The method of handling the suspension of current payments may spell the difference between an increase or a decrease in performance. On an overall basis the combination plans show the best attitude and performance in profitless periods.

Profit-Sharing Developments

1. Profit sharing is still in its infancy;
2. The deferred plan is growing in importance;
3. Almost two-thirds of the profit sharing plans in a 1954 survey were of the deferred type;
4. The trend has been toward the use of profit sharing to provide retirement income and away from the traditional cash profit sharing to supplement current earnings;
5. Profit sharing plans are primarily a small company device;
6. In the small firm, deferred profit sharing tends to be a substitute for a pension plan; in larger companies it tends to supplement it.

Profit sharing will take whatever place in the American economy its performance record justifies. It can be a very powerful factor in preserving and explaining the capitalistic system of free enterprise.

New Developments

One-Can Urethane Coatings Developed

The National Aniline Division, Allied Chemical Corp., 40 Rector St., New York 6, N. Y., has developed one-can urethane coatings.

Urethane coatings are characterized by excellent mechanical and weathering properties. They exhibit rapid drying, good abrasion resistance, satisfactory hardness, and good adhesion.

Two kinds of urethane coatings, which are based on diisocyanates, are presently being marketed—the isocyanate reactive type and the oil-based urethane type. The former has free NCO groups in its composition and cures by the reaction of these groups with cross-linking agents or with the moisture in the air. In the latter type, the isocyanate groups are completely reacted during the preparation to form urethane linkages. Curing is accomplished by the action of atmospheric oxygen on the drying oil radical which is a part of the composition.

In general, the one-can urethane coating is produced by polymerizing Nacconate 80, a diisocyanate, with the alcoholysis product of a drying oil and a polyhydroxy compound. Thus, linseed oil may be transesterified by heating with glycerine to produce a mixture of mono-and di-glycerides. These are, in turn, heated with Nacconate 80 until the isocyanate groups are completely reacted. Then, conventional driers are incorporated.

The similarity of this coating system to the alkyds is apparent from the method of preparation. The phthalic acid of the alkyd system is replaced by a diisocyanate. The urethane linkages are substituted for the carboxylic ester linkages.

After evaluating nearly a hundred different one-can coating compositions, the five which are described in Table I were selected. These five compositions represent a range of drying oils, a range of diisocyanate contents, and a consequent range of costs.

The components of these coatings are listed in Table I.

Of the oil-based urethanes, coatings PC-9, PC-10, and PC-15 are the preferred systems. They compare favorably with the alkyd, the epoxy, and the spar varnish coatings in overall properties. It is well-known that isocyanate reactive coatings, which cure by the reactions of the free NCO groups, generally have properties superior to those of the oil-based urethanes.

Coatings PC-9, PC-10, and PC-15 are outstanding in their resistance to weathering. This is shown both in Weatherometer tests and by six-month exposure tests in Florida. These coatings on exposure show about the same degree of discoloration as a spar varnish and thus, may be used as clear, exterior finishes for wood.

The deficiencies of coatings based on tall oil are well known. The improvement shown by PC-16 over the usual tall oil coating is noteworthy. The improvement with respect to dry time, hardness, and weathering should be noted.

Formulation PC-9 was further evaluated by an independent research laboratory where it was compared with the following:

1. Castor epoxy ester (short oil length).
2. Linseed epoxy ester (long oil length).
3. Popular maintenance vehicle based on a modified medium length epoxy ester.
4. A pure phenolic varnish.
5. An alkyd (medium oil length).

All of these oil-based urethanes can be pigmented without difficulty. In general, pigment loadings in the order of 10-20% P.V.C. are recommended. Normal pigmentation methods have been found to be satisfactory.

Tests show these coatings have better gloss retention, mildew resistance, and resistance to checking and cracking than other commercially available outdoor finishes. In addition, the urethane coatings offer notable cost advantages.

It is reported that these one-can urethane coatings are experimental and require further development work. Considering the rapid drying characteristics, the high gloss, the extreme hardness, and the excellent abrasion and impact resistance of these urethane coatings, the company expects them to secure a market of impressive size.

Component	Coating				
	PC-9	PC-10	PC-12	PC-15	PC-16
Drying Oil	soybean	linseed	linseed (bodied)	linseed and linseed (bodied)	tall
Polyol	glycerine polyether*	glycerine polyether*	glycerine	penta-erythritol	glycerine polyether*
Diisocyanate	TDI**	TDI**	TDI**	TDI**	TDI**
Stabilizer	methanol	methanol	methanol	none	none
Drier	lead and cobalt naphthenates				

*The polyether is a triol having a molecular weight of approximately 1100. Dow 15-100 (Dow Chemical Corporation, Midland, Michigan) was used in these compositions. Other polyethers of equivalent composition should be suitable.

**Nacconate 80 was used in all compositions.

Table I.

Mobay Introduces Protective Coating

A new type of protective coating, based on the reaction of a specially-blocked isocyanate and an amine-bearing resin in an aqueous solution, has been developed by Mobay Chemical Co., Pittsburgh, Pa. Preliminary tests at Mobay's laboratories indicate a strong potential for the new system as an easy-to-apply primer coating for the automotive, appliance, and industrial enamel markets.

Advantages claimed for the new one-component system are: (1) a high order of chemical resistance, (2) excellent adhesion to metals, (3) excellent flexibility, (4) ease of formulation and application, (5) non-toxic properties, (6) non-inflammability and (7) reduced cost.

In formulation, the blocked isocyanate is used in a concentrate of polyamide resin and an emulsifier. Water is added and the composition is then blended by agitation. Colors are achieved by merely adding pigment to the concentrate during agitation.

In this new technique, the reaction of the blocked isocyanate with the polyamide resin at elevated temperatures results in a polyurea linkage, rather than in the more familiar polyurethane linkage which occurs when isocyanate is reacted with hydroxyl-bearing resins.

Curing of the water-based coating is done at normal bake temperatures. The system may also be formulated by using low-cost solvents rather than an aqueous system; however, the use of water as the primary solvent reduces the raw material cost to a minimum. Finished cost is expected to be competitive with lower-cost corrosion-resistant systems of others types now on the market.

•

Plastic Coat Protects Laboratory Furniture

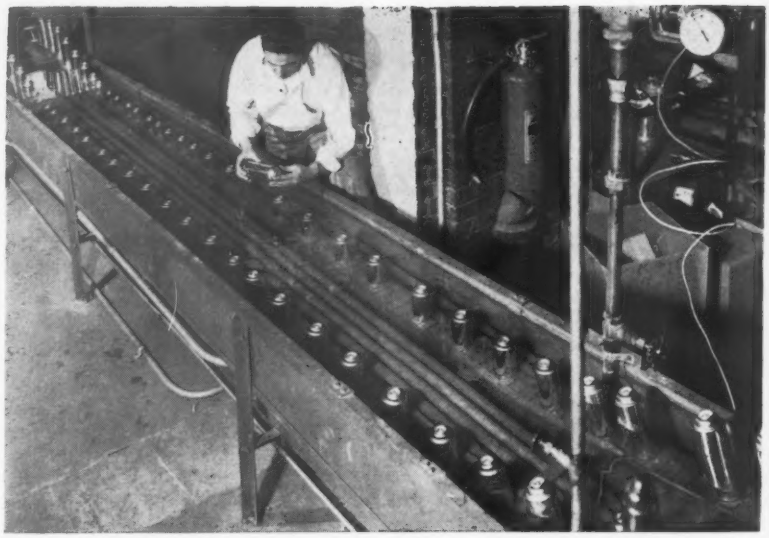
After two years of service, a laboratory furniture coating made of Bakelite epoxy resin has remained unscathed by the attack of chemical fumes and spillage.

A clear epoxy coating applied to woodwork, benches and drawers during the refinishing of The Plastic Coating Corporation's laboratories, Holyoke, Mass., has provided extreme chemical resistance and excellent adhesion at a low overall maintenance cost, according to the equipment manufacturer, Doane & Williams, Inc., Willimansett, Mass.

Clear epoxy was applied to the sides of stone-topped workbenches while a white epoxy coating was used to protect shelves in cabinets where bottled acids and solvents are kept.

In both cases, three coats, each two-mils thick, were applied by spray, and allowed to dry for six hours per coat. The coating offers a pale initial color with high color retention in both clear and pigmented finishes. The finish dries to an extremely high-gloss yet resists chipping unlike conventional lacquer and varnish finishes. Moreover, epoxies provide high-impact resistance as well as resistance to steam or abrasion.

Offering excellent imperviousness to solvents, soaps, detergents and alkalis, the plastic coating has been in constant service at the laboratory where it comes into contact with chemicals and, more particularly, ketonic solvents.



Illinois Bronze uses hot water bath employing magnetic unit for checking leaks in paint-filler aerosol cans.

Auto-Magnetic Method Checks Aerosol Leaks

The Illinois Bronze Powder Company of Chicago, Ill., is said to be one of the few companies in the country which manufactures and packages a complete line of aerosol paints in its own plant. Pioneers in this aerosol paint field, Illinois Bronze found it most important to devise accurate and rapid methods of detecting leaks.

To check for possible leaks in the paint-filled aerosol cans, Illinois Bronze passes them through the hot water bath pictured in the illustration. With this auto-magnetic method defective containers immediately show a conspicuous trail of paint bubbles. Secret of the force that steadies various sized cans on the chain belt conveyors is an installation of Eriez non-electric magnetic Magna-Rails directly beneath each non-magnetic stainless steel belt. The powerful and continuous magnetic field of the stationary Magna-Rail units, acting through the conveyor, holds the cans securely at speeds of 80 per minute yet permits them to be easily plucked from the belt for inspection, as illustrated by Louis Rue, department superintendent.

Another important advantage of this magnetic conveying set-up is that it has eliminated the need for guide rails which had to be adjusted for various size cans.

A product of Eriez Manufacturing Company, Erie, Pa., Magna-Rails are available in easily installed sections of various lengths to permit quick conversion of new or existing conveyor systems into magnetic conveyors or elevators capable of exerting positive non-slip control over metal containers, small machine parts or other ferrous objects, at high speeds and even up near-vertical ascents.

Commercial Paint Spraying Equipment

New commercial paint spraying equipment was introduced to American industry recently by Lofstrand Co., Rockville, Md., at the U. S. Patent Office's Mechanical Exhibit in Washington.

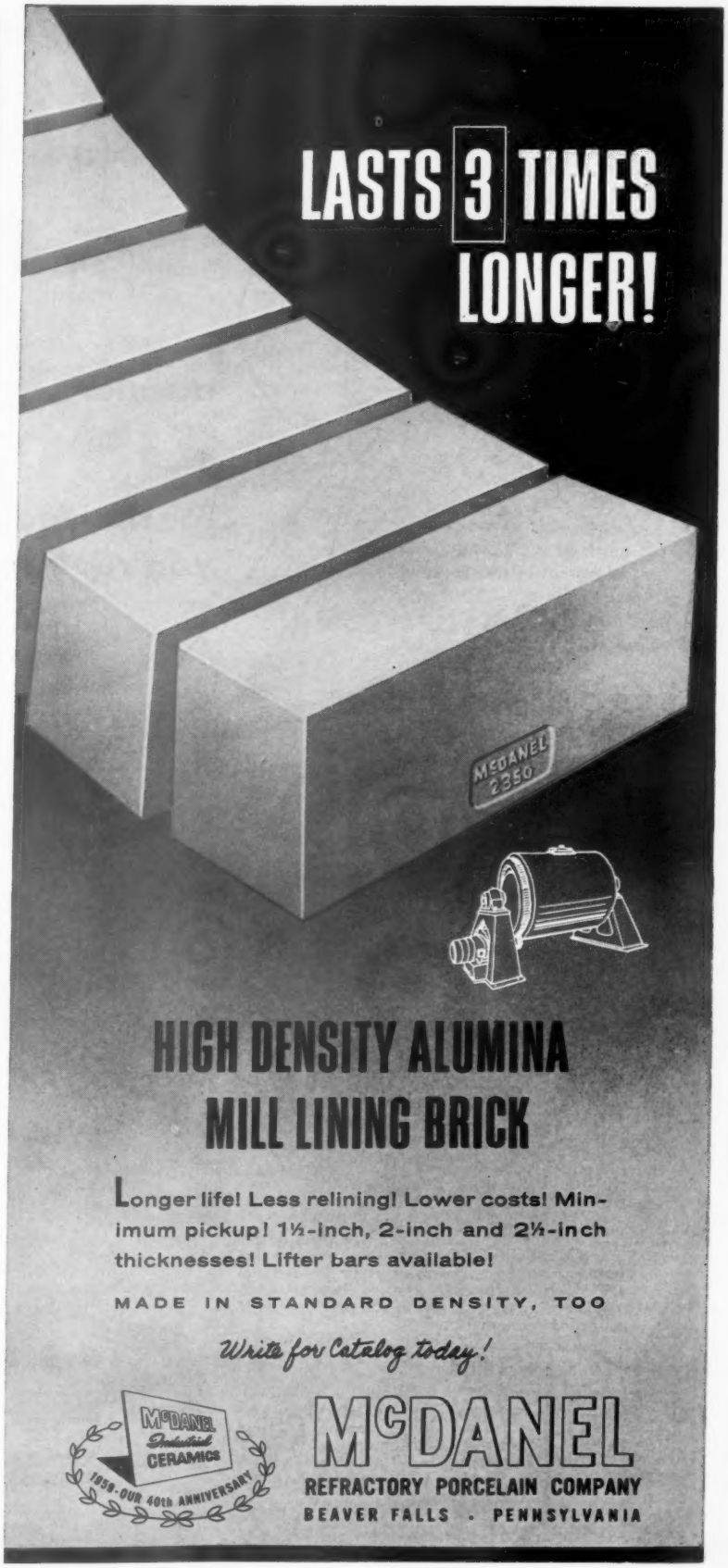
Known as Chemtronic, and contained in a single, compact, portable unit, the equipment discards use of compressed air for transportation of paint materials. It utilizes, instead, a hydrocarbon compound (Chemosene) atomized by an electronic heating element within the unit. With no mechanical parts involved in atomization, Chemtronic performs a noiseless operation.

Compared with other spraying methods now in use by American industry, Chemtronic is claimed to give astonishing high lacquer yield as well as a considerable number of technical advantages.

For example, with Chemtronic there is less spray mist and fewer health hazards in the paint shop. Since molecule weight of the gas formation is 2½ times that of air, the mass of the conveying agent is proportionately larger. Since this is so, atomizing pressure can be reduced and spray mist cut to a minimum.

With Chemtronic there is enormous saving of labor as well as incomparable quality of spraying. Both paint and atomizing gas are heated in Chemtronic, permitting higher concentration of solids in the material and allowing more paint to be sprayed without sagging. Chemtronic actually achieves a finish in one operation, equal in thickness and surface, to two or three coats applied by other spraying processes. The end result is greater production, lower costs, and superior finish.

Chemtronic obviates weather influences. Atomizing gas contains no liquid. Even after a temperature drop due to expansion, with Chemtronic paint reaches the spraying surface relatively warm. Cellulose lacquers can be sprayed by Chemtronic in very high relative humidity without blooming. As a matter of fact with Chemtronic, spraying of many lacquers and paints, formerly regarded as difficult or impossible to spray, now is possible.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HIGH DENSITY ALUMINA MILL LINING BRICK
Longer life! Less relining! Lower costs! Minimum pickup! 1½-inch, 2-inch and 2½-inch thicknesses! Lifter bars available!
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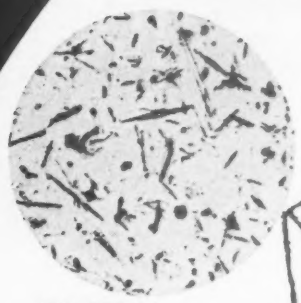
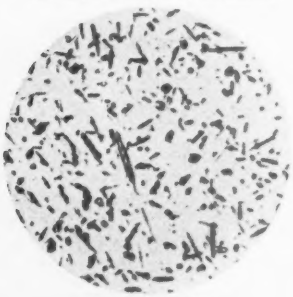
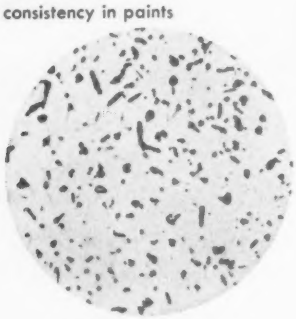
for the degree of oil absorption you require



AZO ZZZ-22
for high consistency in paints



AZO ZZZ-11
for medium consistency in paints



AZO ZZZ-33
for low consistency in paints

AZO acicular zinc oxides are free from detrimental colloidal fines, produce exceptional weathering properties in exterior paints, and are resistant to hard settling during shelf storage. For general use in the production of paints and enamels.

Whether it's high, medium or low, you'll find there is a particular grade of AZO zinc oxide to meet your needs exactly. And, when necessary, we can select within grades the exact degree of desired oil absorption.

AZO acicular lead-free zinc oxide is a superior pigment that will give extra durability, finer weathering qualities to your paints.

ALL AZO PAINT GRADE ZINC OXIDES AVAILABLE AS AZODOX (De-Aerated)

AZODOX has twice the apparent density, half the dry bulk. Faster handling, easier storing, quicker mixing. Costs no more.

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American Zinc was the first, *and is still the only* producer of acicular lead-free zinc oxides covering a wide range of oil absorptions from high to low *and including the intermediate ranges.*

American Zinc sales company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY
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NEW EQUIPMENT AND MATERIALS

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.

MORSE

DRUM LIFTING HOOK
For Volatile Liquids

A new #41M drum lifting hook for handling drums of volatile liquids in hazardous areas has been made available.

The cast hook, made of non sparking manganese bronze, is connected to a large 3″ diameter bronze ring with double 7/16″ diameter brass rods.

The non-sparking hook is attached to any type of hoist by means of a 3″ diameter ring and the hooks are engaged over each end of the drum for safe movement. The hooks have clearance for a ¾″ rim and will accommodate standard 55 gallon drums as well as any drum up to 34″ in length.

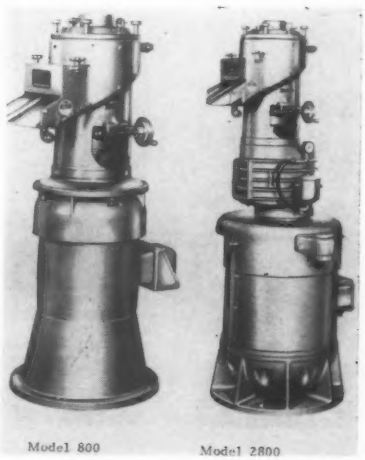
The capacity of this drum lifting hook is 1000 lbs.

Morse Manufacturing Co. EM-1.

DISPERSION MILLS
New Spindle Assembly

Two new mill series with increased stone sizes and peripheral speeds now give a 30—50% gain in capacity over former models, according to the manufacturer.

New model series 800 and 2800 utilize the largest high speed carborundum stones yet developed, eight inches in diameter. The consequent higher peripheral speeds thus make the volume increases possible. In the model 800, the peripheral speed at 3600 rpm (motor operating on 60 cycle) is 7550 fpm; in the model 2800, the peripheral speed at 5400 rpm (motor operating on 60 cycle) is 11,350 fpm. The 800 series mills are equipped with 25 H/P motors and the 2800 series mills are equipped with 50 H/P motors.



MOREHOUSE-COWLES

The most startling feature of the new line of mills is said to be the new spindle assembly with which each will be provided. This all new, more rugged assembly is 1-3/8″ larger than assemblies previously available, seats on a tapered spline on the shaft giving more positive alignment and the top bearing has a full uninterrupted seat, as opposed to the old spindle seat in which the bearing seated on the spline. This new top bearing has an 82% higher thrust rating over top bearings previously employed, and is the only bearing, of the two used in each spindle assembly, that requires lubrication.

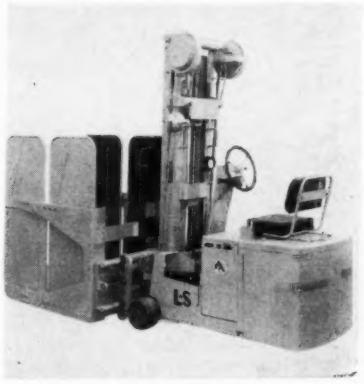
The stone plate, which carries the rotating stone, has newly designed labyrinths, including tapered surfaces and utilizes a "screw effect" to wind materials out of the labyrinths thus eliminating chance of contaminates getting into the bearings below. The assembly is further protected from contaminates by "O" Rings and grease seals which keep foreign materials out and grease in.

Morehouse-Cowles, Inc. EM-2.

To obtain further information on the product items presented in this section, use the handy Readers' Information Service Coupon on page 67.

CLAMP ATTACHMENT
Allows Palletless Handling

New carton clamp attachment for use with L-S electric trucks has been made available.



LEWIS-SHEPARD

The Spacemaster 24 Volt Model "H" with cascade clamp and carton grab arms is said to provide economical, efficient operation and better utilization of warehouse space through palletless handling of cartoned goods.

The carton grab arm design insures equal distribution of clamping pressures over the entire con-

tact area, so that even the most fragile containers are readily handled without damage.

High friction contact surfaces on the plates prevent scuffing and reduce the clamping pressure to a minimum.

Lewis-Shepard Products, Inc. EM-3.

PVAc EMULSION
Good Mechanical Stability

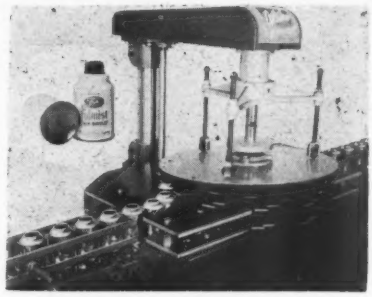
A new fine particle polyvinyl acetate homopolymer emulsion is now available in commercial quantities.

Designated Gelva TS-85, the emulsion has an average particle size of 0.2-0.3 microns and an emulsion viscosity of 1400-1700 cps. at 55% solids. The emulsion is said to have excellent mechanical stability, good blocking resistance and freeze-thaw stability and is highly stable on dilution. Tolerance to most plasticizers: borax, inorganic salts and most organic solvents (except ethyl alcohol) is excellent, the company states.

It is also reported that films cast from this emulsion have outstanding gloss and clarity and possess very good resistance to water, grease and oils. Films are flexible at room temperature without the addition of plasticizer.

Gelva TS-85 is suggested for use in paper coatings, textile finishes, adhesives and surface coatings.

Shawinigan Resins Corp. EM-4.



ADOLPH GOTTSCHO

IMPRINTING ATTACHMENT
For Aerosol Cans

An automatic packaging line imprinting attachment, designed specifically for coding the bottom of aerosol cans, has been introduced.

Called the TB Aerosol Coder, the imprinter is said to operate at speeds up to 600 cans per minute and to accomodate cans of different sizes without use of change parts. Adjustments for both speed and can size can be made in a matter of minutes, according to the company.

The TB Aerosol Coder does not require cutting into an existing packaging line, and does not need any dead plates. Incorporating a simplified 2-roll fast-dry fluid inking system, the unit affords sharp, permanent imprints of one or more lines even on bottom surfaces recessed as much as 5/8". It is said to hold enough ink for round-the-clock operation. Installation can be made by the user in a few hours.

Adolph Gottscho, Inc. EM-5.

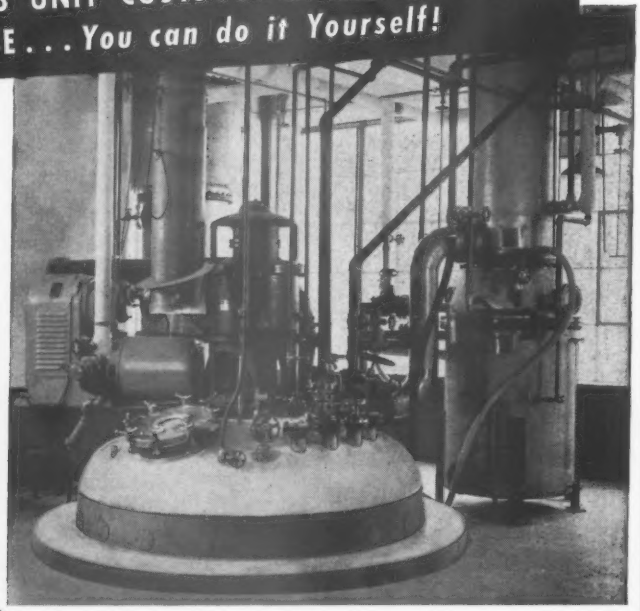
PVP/VA COPOLYMER
Solid Form

A new vinylpyrrolidone/vinyl acetate copolymer in solid form is now commercially available.

It is the newest member of the PVP/VA Copolymer series which Antara has marketed in 50% alcoholic solutions. These copolymers are unique in their film-forming and adhesive properties, broad solubility range, and exceptional compatibility characteristics.

Known as PVP/VA S-630, the new copolymer represents a monomer ratio of 60% vinylpyrrolidone and 40% vinyl acetate. It has a K-value of 30, corresponding to a

BRIGHTON QUALITY CONTROL EQUIPMENT
LOWERS UNIT COSTS . . . INCREASES PROFITS
BECAUSE . . . *You can do it Yourself!*



Wherever Brighton synthetic Resin Kettle Reactor has been installed, lower costs per gallon in the production of synthetic resins have justified the modernization of plant facilities. Operational charts indicate less cooking time, clearer alkyds, better quality, uniform viscosity. Because Brighton's synthetic Resin Kettle Reactor, adaptable to Solvent or Fusion cooking is automatic, you can better control your production and inventory.

Write for complete information on "Synthetic Resins, How To Do It Yourself."

* Recent installation, Automatic Radiant Gas Fired Resin Kettle with solvent reflux Condensor and Decanter.

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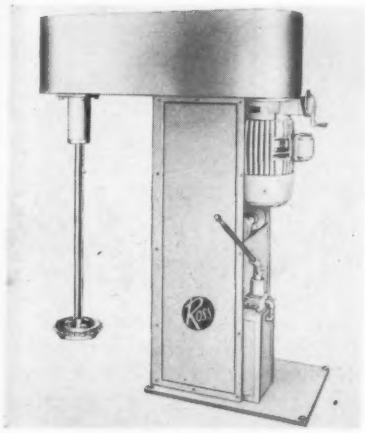
mean molecular weight of 40,000. It forms stable suspensions in water and may be incorporated into aqueous or organic solvent systems. PVP/VA S-630 is designed for use wherever it is necessary or desirable to avoid alcohol.

General Aniline & Film Corp. EM-6.



CHARLES ROSS

DISSOLVER
Multiple Action Impeller

A high speed dissolver or disperser has been developed.

The machine features a specially designed multiple action impeller or millhead which effectively mixes, disperses, dissolves, emulsifies and deagglomerates most types of liquid, paste or heavy paste materials. The material is drawn down into the millhead by specially pitched impeller vanes and thrown at high speed with tremendous impact against special baffles to break down lumps or agglomerates. Further abrasive action occurs as material is pumped through a very narrow orifice with spaced disperser bars. The third separate force the material is subjected to is the sawtooth cutting or shearing action of the specially set teeth spaced around the outer periphery of the millhead, and lastly the material is jetted out laterally in a very thin stream at speeds up to 120 M.P.H.

The disperser can be used in any size tanks or containers from standard 55-gallon steel drums up to tanks measuring 40″ diameter by 45″ deep, and millhead is readily raised out of the tank by simple hydraulic jacking unit. Variable speed is provided for setting millhead speeds anywhere between 2059 FPM and 10323 FPM as required. Stainless steel shaft and millhead are standard, and millhead can be readily cleaned.

Charles Ross & Son Co. EM-7.

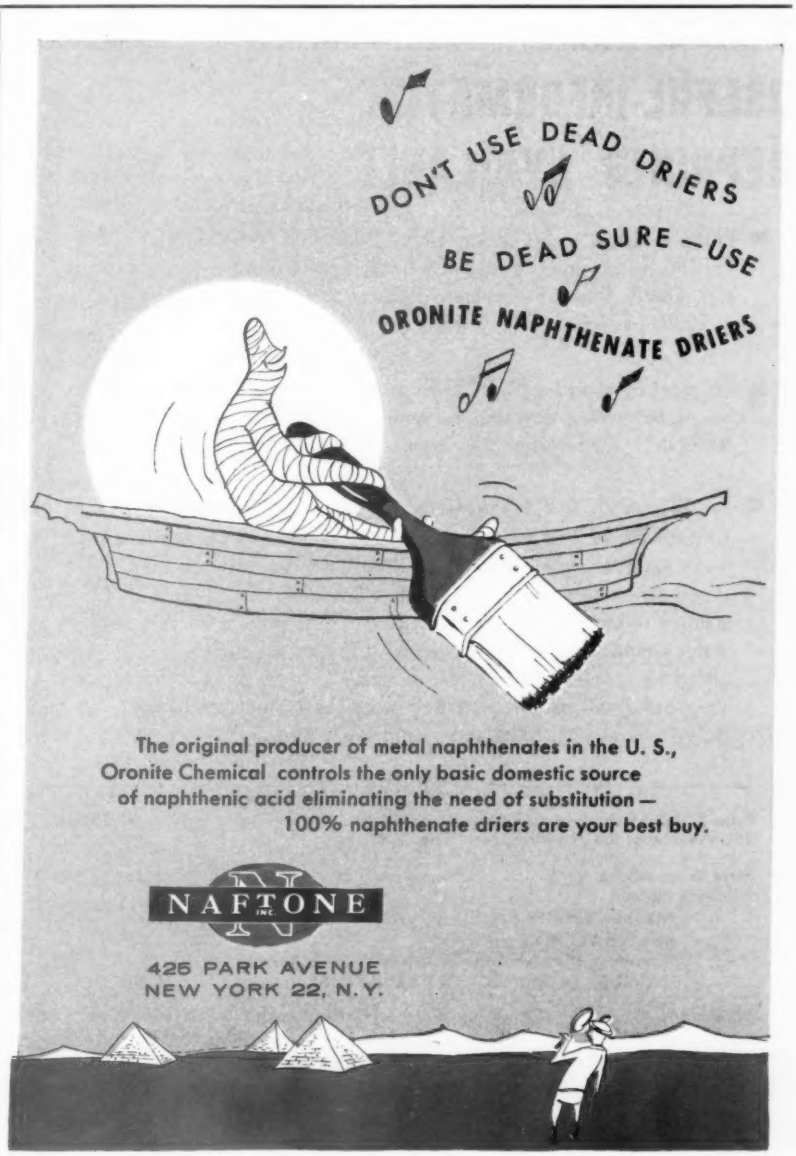
LABELING MACHINE
Intermittent Labeling

A new line of labeling machines has been announced. The three models are the Roll-Thru Labeler for round containers, Gallon Can Labeler, and Flat Carton Labeler.

The Roll-Thru Labeler (Model 21A) is designed to handle round containers and features an automatic electronic feeder. It labels 30 to 60 units per minute and has a variable speed drive. This new model labels up to 7 inch widths and a 5 inch capacity of labels can be stacked in the feed hopper. Model 21A takes the following sizes: 1½ in. diameter to 1 gallon jug with ears in round glass containers; 1/8 pint through 1 quart in tin round containers; and sizes up to 8 inch diameter in fiber round containers.

The Gallon Can Labeler (Model 14A) is an adaptation of the

To obtain further information on the product items presented in this section, use the handy Readers' Information Service Coupon on page 67.


DON'T USE DEAD DRIERS
BE DEAD SURE — USE
ORONITE NAPHTHENATE DRIERS
The original producer of metal naphthenates in the U. S.,
Oronite Chemical controls the only basic domestic source
of naphthenic acid eliminating the need of substitution —
100% naphthenate driers are your best buy.
NAFTONE INC.
425 PARK AVENUE
NEW YORK 22, N.Y.

Standard Labelette (Model 11A). This new model has the added convenience of an automatic electronic feeder, making it possible to efficiently deliver the label to a gallon can with lugs and to register the label cut-out. Another added feature is its 2-speed option: low or moderate.

The third new model developed is a Flat Carton Labeler (Model 30), and also features an automatic electronic feeder. This model handles labels approximately 1 in. wide by 2 in. long, applying them to any flat carton in knockdown form. It can be adapted for use on any flat carton up to 36 in. wide and also for labeling set-up cartons and envelopes. This machine applies the label to the underside surface. Other features include: speeds from 25 to 50 units per minute, variable speed drive; and a 5 in. capacity of labels can be stacked in the feed hopper.

Labelette Company. EM-8.

STABILIZER
Barium-Cadmium Complex

Development of Nuostabe V-134, a barium-cadmium complex stabilizer, has been announced.

Laboratory tests, in various types of vinyl formulations, indicate, it is claimed, that Nuostabe V-134 is more effective than any such liquid stabilizer presently available.

The new product is primarily for use in calendering, plastisol, organosol, extrusion, injection molding and solution formulations. The primary advantage of Nuostabe V-134, over standard barium-cadmium complex stabilizers, is that it is said to impart superior heat and light stability and sheet color to these compounds at no additional cost.

Nuodex Products Company, EM-9.

HUNTER

GLOSSMETER
Multipurpose

A new photoelectric glossmeter has been designed. Accuracy is said to be assured by precise machine construction and assembly of all optical components. Adaptability of the instrument to both standard and new gloss tests is achieved by building elements of the incident and reflected light beams onto aluminum blocks which are mountable at either 75°, 60°, 45°, or 20°. Because of the ease with which beam and field angles can be changed, the instrument is claimed to be ideally suited for special gloss tests of new products.

The optical and electrical units are in separate housings connected by cable. The instrument can thus be used:

1. With specimen on front as shown,
2. Turned on its back with specimen mounted horizontally on top, or
3. With optical unit separate and mounted either flush in a table top for examination of large sheets or over a moving web for gloss recording.

For the paint, plastics, and floor covering industries, the new instrument will measure gloss by the long-established 60° method of ASTM D523, and also by the new two-parameter 60° method for fur-

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- To meet demand for N. P. Barr's article on GLYCERINE ALKYDS, we made reprints covering the subject of "POLYOLS IN ALKYD RESINS". Order your copy now, 50c per copy.

- In "BEHAVIOR OF PAINT SYSTEMS UNDER ULTRAVIOLET RADIATION," Dr. Max Kronstein's study includes solution coatings, water emulsion coatings, and modified water emulsion coatings. The report covers three groups: (a) Paints based on film formers used in a state of solution; (b) Paints based on film formers used in a state of water emulsion; (c) Modifications of the vehicles used in "B" with alkyd resin solutions. $1.50 per copy. Supplies are limited, and your order will be filled as long as we have stock on hand. Don't delay. Send your order and Remittance now.

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niture finishes (ASTM D1461). Accurate high-gloss measurements by the 20° method of ASTM D523 are possible, but low-gloss measurements of 85° sheen cannot be made.

For high precision, a digital dial is used in the measurement arm of a null-balance bridge. This digital dial is operated either manually or by servo-motor.

Hunter Associates Laboratory, Inc. EM-10.

ESTERIFIED SHELLAC
Wax-Free

The availability of ES-45, described as an esterified and modified wax-free refined shellac, has been announced.

The new ester is said to have been especially treated and processed for use with nitrocellulose, ethyl cellulose, vinyls, alkyds, maleics, phenolics, and numerous other film-forming materials. Its properties have enlarged its formulation range in the coatings and ink industries. Among the claimed advantages achieved with formulations containing ES-45 are improvements in gloss, flexibility, adhesion, leveling, and ultraviolet light resistance.

ES-45 has excellent color and non-corrosive stabilities. Its extremely lighter color adds to its possibilities of additional end uses.

ES-45 has a high degree of tolerance for hydrocarbons, ketones and ester solvents. It is used as a film former and plasticizer and yet yields films which set up rapidly to a tack free stage.

The Mantrose Corp. EM-11.

VINYL PLASTICIZERS
For Use in Vinyl Plastics

Two new epoxy-containing plasticizers for vinyl resins are now being produced in pilot plant quantities.

The new compounds, Flexol plasticizers 107-D and 163-D, function both as plasticizers and as vinyl chloride stabilizers. They are completely compatible with vinyl chloride resins even at concentrations as high as 70 parts of plasticizer per 100 parts of resin.

Flexol plasticizer 107-D, which chemically is di(2-ethylhexyl)-4,5-epoxy tetrahydrophthalate, is quite similar in plasticizing properties to dioctyl phthalate. The principal differences, which are attributed to the presence of the epoxy group, are that it is less volatile and has stronger solvating power and a somewhat higher brittle temperature. It imparts long-term stability to vinyl compositions and is highly resistant to fungus attack.

Flexol plasticizer 163-D, chemically named di(iso-decyl)4,5-epoxy tetrahydrophthalate, is similar in plasticizing properties and structure to di(iso-decyl) phthalate. However, it is even less volatile and more resistant to extraction by oil than di(iso-decyl) phthalate. The new plasticizer is also a good heat and light stabilizer for vinyl chloride resins and is not susceptible to fungus attack.

Both plasticizers are particularly suitable for use in vinyl plastics where superior resistance to outdoor weathering is required. These new products are also potentially useful as acid acceptors for chlorinated solvents and as plasticizers for nitrocellulose coatings.

Union Carbide Chemicals Co. EM-12.

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Pump, said to be ideal for handling neutral or corrosive liquids and for gases, now available.

A control knob permits the volume per stroke to be independently controlled from zero to maximum, even when running. The transmission operating in oil is separated from the pistons to eliminate contamination. Pump bodies are readily demountable and made of either ceramic, tempered glass or teflon, with ground-in ceramic plungers.

The clearance volume remains constant since the piston returns to the same point on the output stroke. The pump makes about 95 strokes per minute that can be varied from 0″ to 19/32″.

With a dual pump it is possible to meter fluid with one section and gases with the other. A dual pump weighs about 31 lbs. net. Single and dual laboratory, as well as multiple heavy industrial models are available.

C. H. Stoeling Co. EM-13.

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PATENTS

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Mixed Resinous Esters

U. S. Patent 2,887,459. Raymond F. Carmody, Metuchen, N. J., assignor to Socony Mobil Oil Co., Inc., a corporation of New York

A composition of matter comprising a resinous ester (I) of a vegetable oil-modified alkyd resin (II) of phthalic anhydride and a saturated aliphatic polyhydric alcohol having at least three hydroxyl groups per molecule, said resin (II) containing at least one hydroxyl group for each carboxylic acid group thereof and consisting of the elements carbon, hydrogen and oxygen, and of an epoxide resin (III), said epoxide resin (III) comprising partially esterified polymeric polyethers of 4,4'-dihydroxydiphenyl-2,2-propane and a chlorhydrin selected from the group consisting of epichlorhydrin and glycerin dichlorhydrin, said epoxide resin (III) containing terminal epoxide groups and secondary hydroxyl groups, at least forty percent of the available epoxide and hydroxyl groups thereof being esterified with an acid selected from the group consisting of a vegetable oil fatty acid, a rosin acid and mixtures of said acids, the weight of epoxide resin (III) prior to esterification with said vegetable oil-modified alkyd resin (II) to form said resinous ester (I) being from about one percent to twelve percent of the total resin solids.

Coating Compositions Containing Organosiloxanes

U. S. Patent 2,884,388. Robert C. Hedlund, Midland, Mich., assignor to Dow Corning Corp., Midland, Mich., a corporation of Michigan.

A composition of matter comprising (1) an organic film-forming coating resin, (2) a metallic pigment in amount from .5-100 parts by weight per 100 parts by weight of the coating resin, and (3) from .01-2 parts by weight per 100 parts by weight of the coating resin of benzene soluble organopolysiloxane of at least 50,000 cs. viscosity at 25°C., said siloxane having on the average from 1.99 to 2.01 monovalent hydrocarbon radicals per silicon atom, at least 50 percent of the polymer units in said siloxane being of the formula RMeSiO in which Me is the methyl radical and R is an aliphatic hydrocarbon radical of less than 4 carbon atoms and any remaining polymer units being of the formula

$$R'_nSiO_{\frac{4-n}{2}}$$

in which R' is a monovalent hydrocarbon radical of from 1 to 18 inclusive carbon atoms and n has a value from 1-3 inclusive.

Paint Vehicle With Fungicidal Properties

U. S. Patent 2,884,330. Leo A. Goldblatt and Lucine L. Hopper, Jr., New Orleans, La., assignors to the U.S.A. as represented by the Secretary of Agriculture.

A fungicidal paint and varnish comprising, as the film-forming component thereof, a film-forming resin containing chemically available hydroxyl groups and a film-forming ester of an organic fungicide selected from the group consisting of tripropionin and undecylenic acid with a member selected from the group consisting of a drying oil, drying oil fatty acids, and mixtures thereof.

Aqueous Pigmented Dispersion

U. S. Patent 2,883,355. Bernard James Balfe, Stowmarket, and Peter George Edgerley, Stevenage, England, assignors to Imperial Chemical Industries, London, England, a corporation of Great Britain.

A pigmented dispersion having a continuous aqueous phase, at least one dispersed pigment and a dispersed copolymer of butadiene-1,3 and methyl methacrylate the weight of copolymerised methyl methacrylate units in the copolymer being from 60 to 70% by weight of the copolymer and the ratio of copolymeric material to pigment being from 1.0 parts to 4.0 parts by volume of copolymer to each part by volume of pigment including any pigment extender.

Water-Emulsion Paints Containing Cyanoethylated Starch

U. S. Patent 2,881,143. Albert R. Wilson, La Marque, Tex., assignor to Monsanto Chemical Co., St. Louis, Mo., a corporation of Delaware.

A water-base emulsion paint resistant to decomposition arising from attack by microorganisms comprising an intimate mixture of a pigment, an aqueous dispersion of a copolymer composed of from about 20% to about 40% by weight of a conjugated diene and correspondingly from about 80% to about 60% by weight of an ethylenic compound polymerizible therewith in chemically combined form, and cyanoethylated starch as a protective colloid.

Can Coating Varnishes

U. S. Patent 2,880,188. John F. McKay, Cranford, N. J., assignor to Esso Research and Engineering Co., a corporation of Delaware.

A coating composition which when applied to a metallic surface and cured at about 215-245°C. for about 8 to 20 minutes forms a protective coating for said surface which has improved resistance to cracking and chemicals; said composition comprising a mixture of about 25 to 75 parts by volume of a vegetable oil selected from the group consisting of tung oil, oiticica oil, fish oil, and dehydrated castor oil, and about 75 to 25 parts by volume of another vegetable oil selected from the group consisting of linseed oil, perilla oil and soybean oil, about 0.003% to about 0.02% by weight based on the total composition of a manganese carboxylate soap drier and an olefin-diolefin resin obtained by polymerizing a steam-cracked petroleum fraction boiling between about 20°C. to 280°C. which contains about 15 to 60% piperylene; the ratio between the resin and the vegetable oil mixture being about 100 lbs. resin per 15-25 gallons of the vegetable oil mixture said manganese carboxylate soap drier being the sole metallic carboxylate soap drier employed.

Minimizing Formation of Craters in Coatings

U. S. Patent 2,884,339. Hans Dannenberg, Berkeley, Calif., assignor to Shell Development Co., New York, N. Y., a corporation of Delaware.

A process for minimizing the formation of craters in surface coatings prepared from polyepoxides having an epoxy equivalency greater than 1.0 which comprises applying to the surface of the metal substrata prior to application of the polyepoxide a layer 30 to 60 molecules thick of a polymer having a main hydrocarbon chain to which is attached (1) a plurality of long alkyl side chains containing from 16 to 32 carbon atoms and (2) a plurality of polar groups selected from the group consisting of hydroxyl group, carboxyl group and ester groups.

Alkyd Resins From Dicyclopentadiene

U. S. Patent 2,881,144. Charles A. Cohen, Roselle Park, N. J., and Louis A. Mikeska, Dunedin, Fla., assignors to Esso Research and Engineering Co., a corporation of Delaware.

A modified alkyd resin composition which comprises the product of the reaction at a temperature between about 350° and 500°F. of 20 to 60 parts by weight of a trihydric alcohol; 100 to 150 parts by weight of a dicylopentadiene dicarboxylic acid selected from the group consisting of dicylopentadiene dicarboxylic acid, methyl dicyclopentadiene dicarboxylic acid, dimethyl dicyclopentadiene dicarboxylic acid, the

di- and tetrahydrogenated products of the first three members of this group and mixtures thereof, and a coreactant selected from the group consisting of 40 to 70 percent of fatty oils based on said resin composition and 30 to 60 weight percent of fatty acids based on said resin composition.

Aqueous Coating

U. S. Patent 2,883,300. Herbert B. Rickert, Midland, Mich., assignor to The Dow Chemical Co., Midland, Mich., a corporation of Delaware.

An aqueous coating composition the film forming binder of which consists of a mixture of coal acids and a starch, the coal acids content ranging between 10 and 90 percent by weight of the binder solids and the starch content ranging between 90 and 10 percent of the binder solids, said binder solids being plasticized with between 10 and 50 percent of their weight with a plasticizer which is a water-soluble liquid polyhydric compound of the group consisting of polyhydric alcohols and polyalkylene glycols and having water in amount sufficient to give a desired consistency, the starch being in gelatinized form.

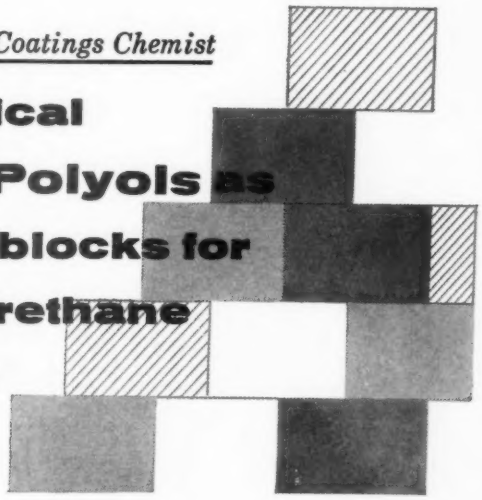
Polyisocyanate Coating For Leather

U. S. Patent 2,884,340. Sam Loshaek, Hatboro, Pa., assignor to Rohm & Haas Co., Philadelphia, Pa., a corporation of Delaware.

A method of producing a coated leather comprising reacting in an organic solvent (A) a member of the group consisting of (1) a film-forming addition polymer formed exclusively of at least one monomer selected from the group consisting of vinyl chloride, vinyl acetate, vinyl propionate, vinylidene chloride, acrylonitrile, methacrylonitrile, and alkyl esters of an acid selected from the group consisting of acrylic and methacrylic acids and (2) a polymeric plasticizer selected from the group consisting of polyester condensates of a dicarboxylic acid and a polyhydric aliphatic alcohol having 2 to 12 carbon atoms, said member containing reactive groups selected from hydroxyl, mercapto, carboxyl, and amino and amide groups containing at least one reactive hydrogen atom on the nitrogen on such groups, with (B) an amount of a polyisocyanate more than that equivalent to the reactive groups of the member so that at least a portion of the isocyanate groups remain unreacted, said polyisocyanate being selected from the group consisting of aliphatic and aromatic hydrocarbon diisocyanates and triisocyanates, and aromatic hydrocarbon diisocyanates substituted on the aromatic ring by alkoxy groups, adding the resulting solution to a solution in an organic solvent of a film-forming addition polymer formed exclusively of at least one monomer selected from the group consisting of vinyl chloride, vinyl acetate, vinyl propionate, vinylidene chloride, acrylonitrile, methacrylonitrile, and alkyl esters of an acid selected from the group consisting of acrylic and methacrylic acids containing a dispersed pigment to form a dispersion comprising per 100 parts of addition polymer, 20 to 100 parts by weight of the aforesaid plasticizer, and 5 to 100 parts of pigment, said dispersion also comprising 1 to 65 parts of a polyisocyanate selected from the aforesaid group thereof in reacted form per 100 parts of the total of addition polymer and plasticizer, applying said dispersion to a leather, and drying the coated leather at a temperature of at least about 20°C. while reacting only a portion of the isocyanate groups, then, within 24 hours of the application of the aforesaid dispersion and before the isocyanate groups have been completely reacted, applying as a final coat on the coated leather a composition consisting essentially of an organic solvent in which there is dissolved (1) a film-forming addition polymer formed exclusively of at least one monomer selected from the group consisting of vinyl chloride, vinyl acetate, vinyl propionate, vinylidene chloride, acrylonitrile, methacrylonitrile, and alkyl esters of an acid selected from the group consisting of acrylic and methacrylic acids, and (2) 15 to 80 parts, per 100 parts of the addition polymer therein, of a polymeric plasticizer therefore selected from the group consisting of polyester condensates of a dicarboxylic acid and a polyhydric aliphatic alcohol having 2 to 12 carbon atoms, and then drying the coated leather at a tem-

From Baker to the Coatings Chemist

economical Castor Polyols as building blocks for quality Urethane coatings



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Bayonne, New Jersey

perature at least as high as normal room temperature to simultaneously effect reaction of the partially reacted polyisocyanate with one of the polymeric components of the final coat.

Fire Retardant Composition

U. S. Patent 2,881,088. Wilhelm Schulenburg, Frankfurt am Main, Germany, assignor to Alim Corp., New York, N. Y.

A fire retardant composition comprising a mixture of 50 to 80 parts by weight of a foam forming component selected from the group consisting of monoammonium phosphate, diammonium phosphate phosphoric acid ammonium sulfate, sulfamic acid, ammonium sulfamate, ammonium bromide, sodium tungstate, sodium borate and boric acid, 10 to 50 parts by weight of a carbon forming component selected from the group consisting of starch, dextrin, gum tragacanth, flour, mannitol, glucosamine, glue, casein and gelatine and 3 to 50 parts by weight of a synthetic resin component comprising a urea-formaldehyde-acrolein resin in which the proportion of the urea component, formaldehyde component and acrolein component is about 2.0-2.5 moles of formaldehyde component, 0.12 mole of acrolein component per mole of urea component.

A method of protecting an article against fire which comprises applying a solution containing 3 to 50 parts by weight of a urea-formaldehyde-acrolein resin in which the proportion of the urea component, formaldehyde component and acrolein component is about 2.0-2.5 moles of formaldehyde component, 0.12 mole of acrolein component per mole of urea component to such article and applying a finely divided solid mixture of 50 to 80 parts by weight of a foam forming component selected from the group consisting of monoammonium phosphate, diammonium phosphate, phosphoric acid ammonium sulfate, sulfamic acid, ammonium sulfamate, ammonium bromide, sodium tungstate, sodium borate and boric acid and 10 to 50 parts by weight of a carbon forming component selected from the group consisting of starch, dextrin, gum tragacanth, flour, mannitol, glucosamine, glue, casein and gelatine to such article while still wet with such solution.

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Thin Film Rust Prevention

U. S. Patent 2,883,289. Michael J. Furey, Berkeley Heights, and Eric O. Forster, Scotch Plains, N. J., assignors to Esso Research and Engineering Co., a corporation of Delaware.

A coating composition adapted to prevent rusting consisting essentially of a major proportion of a cutback asphalt and from about 0.1 to 10.0 wt. per cent of a zirconium salt of an aliphatic monocarboxylic acid having about 12 to 24 carbon atoms per molecule.

Alkyd Resins

U. S. Patent 2,881,145. Alfred F. Schmutzler, Stamford, Conn., assignor to American Cyanamid Co., New York, N. Y., a corporation of Maine.

A coating composition comprising (1) a glyceride oil modified alkyd resin, (2) a reactive pigment selected from the group consisting of a zinc pigment, white lead, chrome yellow, molybdate orange, litharge and peacock blue and (3) between about 0.1%-10% by weight based on the total weight of said pigment of a trialkyl ester of a phosphorus-containing acid wherein said alkyl groups contain between 2 and 6 carbon atoms.

Cellulosic Varnishes and Paints

U. S. Patent 2,883,350. Paul Baudecroux, L'Etang-la-Ville, France; Rice Juliette Sebbah Baudecroux, widow and heir of said Paul Baudecroux, deceased, and guardian of Jean Paul Baudecroux and Micheline Rosemonde Baudecroux, minor heirs.

A process for opacifying a cellulosic varnish selected from the class consisting of cellulose ester varnishes and cellulose ether varnishes and containing a lower aliphatic alcohol as an extender, which comprises incorporating lithium chloride into said varnish.

Thermosetting Coating

U. S. Patent 2,880,194. David W. Glaser, St. Paul, Minn., assignor to General Mills, Inc., a corporation of Delaware.

Compositions suitable as protective coatings comprising (*a*) an aliphatic

diamine having an iodine number greater than 75 and the structural formula

$$R—N—(CH_2)_xNH_2$$
(H on N)

in which R is an aliphatic hydrocarbon radical having 8 to 22 carbon atoms and x is an integer from 1 to 4, and (b) a glycidyl polyether of 2,2-bis(p-hydroxy phenyl) propane having an epoxy equivalent of 140 to 1,000.

Mildewcide and Flameproofing Composition

U. S. Patent 2,881,097. Anthony Giordano and William J. Straka, Cleveland, Ohio, assignors to The Harshaw Chem. Co., Cleveland, Ohio, a corporation of Ohio.

A fibrous cellulosic material impregnated with a composition having flame retardant and mildewcidal properties, said composition essentially consisting of a mixture of copper antimonate and a halogenated organic compound, said organic compound being selected from the class consisting of halogenated paraffins, halogenated vinyl resins, halogenated rubber, halogenated vegetable oils, halogenated animal oils, and halogenated mineral oils, said copper antimonate being present as a dispersion in said composition in the range from about 2.5% to about 31% by weight of the fibrous cellulosic material, and said halogenated organic compound being present in an amount sufficient to give a range from about 2.0% to about 35% of halogen by weight of the fibrous cellulosic material.

Pigment-Binding Methods

U. S. Patent 2,883,304. Benjamin B. Kine, Levittown, and Albert C. Nuessle, Hatboro, Pa., assignors to Rohm & Haas Co., Philadelphia, Pa., a corporation of Delaware.

A method for coloring a textile material comprising the steps of applying to a textile fabric an aqueous composition comprising a water-insoluble pigment intimately mixed with a binder comprising a water-insoluble linear copolymer of monoethylenically unsaturated monomers consisting of 85% to 99% by weight of at least one alkyl ester of an acid selected from the group consisting of acrylic and methacrylic acids in which the alkyl group contains 1 to 8 carbon atoms and 1 to 15% by weight of a monomer having the general formula

$$CH_2=CH—O—A—NRCONHR'$$

where A is selected from the class consisting of (1) etheroxygen linked alkylene groups having 2 to 3 carbon atoms and (2) alkylene groups having 2 to 4 carbon atoms between the adjoining oxygen and nitrogen atoms, and R and R′ are each selected from (1) separate groups individually selected from the class consisting of hydrogen, methyl, ethyl, propyl, isopropyl, and ether-linked lower aliphatic groups having 1 to 3 carbon atoms and (2) composite ring-closing alkylene groups selected from the class consisting of—CH_2CH_2—, —$CH(CH_3)CH_2$— and —$CH_2CH_2CH_2$—, the ratio of the weights of binder to pigment being from 1:1 to 8:1, and then drying and heating the fabric at a temperature of 180° to 350°F. for a period of a half-minute to about thirty minutes.

Aqueous Colloidal Dispersions

U. S. Patent 2,888,421. Edgar M. Adams and Robert L. Johnson, Midland, Mich., assignors to The Dow Chemical Co., Midland, Mich., a corporation of Delaware.

An aqueous colloidal dispersion comprising (1) a synthetic latex containing in the disperse phase a polymer obtained by polymerizing an olefinically unsaturated monomer and (2) from about 0.002 to 1 percent by weight of an aliphatic nitroalcohol, said nitroalcohol containing from 1 to 2 hydroxyl radicals per molecule and containing no more than 8 carbon atoms in an uninterrupted carbon chain and wherein the amount is based on the total weight of the aqueous colloidal dispersion.

Wax Coating

U. S. Patent 2,885,340. John D. Tench, Prospect Park, Pa., assignor to Sun Oil Co., Philadelphia, Pa., a corporation of New Jersey.

A wax composition consisting essentially of a hydrocarbon paraffin wax derived from petroleum and having a melting point of from 125° F. to 132° F., a tensile strength at 40° F. of from 275 p.s.i. to 325 p.s.i., the tensile strength at 40° F. being at least 25 p.s.i. higher than the tensile strength at 70° F.,

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Rutile Titanium Dioxide	214.0
MULTIFEX MM	100.0
Epoxy Resin (Amine)	386.0
Cellosolve Acetate	124.0
Methyl Isobutyl Ketone	126.0
(Grind 24 hours in pebble mill and add...)	
Chlorowax® 70 — 60% in Toluol	210.0
Total	1,162.0

TEST RESULTS:	With Multifex MM
Initial Gloss	Full
Gloss after 750 hours	Low
Checking	None
Rusting	None
Chalking	Yes
Blistering	None
Loosening & Removal	None
Adhesion	Good

Diamond Chemicals

and from 1.4% to 2.6% by weight of a microcrystalline wax derived from petroleum and having a melting point of from 185° F. to 200° F., a viscosity of from 81 to 89 SUS at 210° F., a refractive index (n_d^{212}) of from 1.435 to 1.438, a penetration of from 30 to 65 at 160° F., and a penetration of not above 5 at 77° F.

Air-Drying Resinous Ester

U. S. Patent 2,885,375. Conrad J. Campbell, New Castle, Del., assignor to Hercules Powder Co., Wilmington, Del., a corporation of Delaware.

An air-drying resinous ester having an acid number less than 50 prepared by the esterification of ingredients consisting essentially of a partial allyl ether of pentaerythritol having at least two free hydroxyl groups per molecule, a fatty acid substance selected from the group consisting of drying fatty oils and drying fatty acids, and a dicarboxylic acid selected from the group consisting of phthalic acid, isophthalic acid, terephthalic acid, succinic acid, adipic acid, azelaic acid and sebacic acid, the proportion of said ingredients being such as to provide an approximate stoichiometric equivalence of hydroxyl and carboxyl groups.

Modified Polydiene Coating

U. S. Patent 2,888,417. Willie W. Crouch, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Delaware.

A method of preparing a coated metal particularly suited for use in can manufacture which comprises applying a substantially uniform coating in the range of 1 to 10 milligrams per square inch to said metal of a composition comprising an organic solvent solution containing 20 to 70 weight percent of (A) 90 to 75 weight parts of a liquid polymer prepared by polymerizing monomeric materials comprising at least 50 weight parts per 100 parts total monomers of a conjugated diene of 4 to 6 carbon atoms, said liquid polymer having a Saybolt Furol viscosity at 100° F. in the range of 100 to 6,000, and a molecular weight in the range of 300 to 3,000 and (B) 10 to 25 parts by weight of an alkyd resin prepared by esterifying a polyhydric alcohol containing not more than 15 carbon atoms per molecule with a polycarboxylic acid containing not more than 15 carbon atoms per molecule, said alkyd resin being modified with 2 to 6 weight parts of a vegetable drying oil per part polyhydric alcohol, and curing said coating on said metal at a temperature in the range of 65 to 600° F.

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Stabilized Latex Coating

U. S. Patent 2,887,460. Carl L. Dibert, St. Louis, and Dudley A. Taber, Midland, Mich., assignors to The Dow Chemical Co., Midland, Mich., a corporation of Delaware.

A film-forming, non-acidic, aqueous coating composition comprising a pigment selected from the group consisting of zinc oxide and calcium sulfate-extended titanium dioxide, a film-forming polymer aqueous dispersion that is normally disposed to thicken when mixed with such pigment and wherein the polymer is an addition polymer of an ethylenically unsaturated monomer, and a glycolamine stabilizer having the formula wherein the symbol R— represents an aliphatic radical having from 8 to 18 carbon atoms and the symbols x and y are integers the sum of which is from 2 to 10, which glycolamine is soluble in water to form a 10 percent by weight solution that has a cloud point temperature of not more than 95° C., the glycolamine being present in amount corresponding to from 3 to 20 parts by weight per 100 parts by weight of the polymer.

Film Forming Aqueous Colloidal Dispersions

U. S. Patent 2,888,422. Robert L. Johnson and Edgar M. Adams, Midland, Mich., assignors to The Dow Chemical Co., Midland, Mich., a corporation of Delaware.

An aqueous colloidal dispersion comprising (1) a synthetic latex containing in the disperse phase a polymer obtained by polymerizing an olefinically unsaturated monomer and (2) from about 1 percent by weight of tris(hydroxymethyl)nitromethane wherein the amount is based on the total weight of synthetic latex.

TECHNICAL Bulletins

RESIN

Marbon Chemical Division, Borg-Warner Corp., Dept. PVP, Box 68, Washington, W. Va. has issued four technical reports detailing properties and advantages of new 1100 TMV resin.

Properties of the new resin are described in Marbon Paint Bulletin No. 1, an eight-page report representing basic characteristics, chemical resistance tests, solution and film compatibility, viscosity and drying time. Paint Bulletin No. 2, covering advantages of 1100 TMV in multicolor paints, includes facts on convenience of formulation in conventional paint-making equipment and use of lower-priced solvents.

Step-by-step information of formulating multicolor paints with Marbon 1100 TMV is provided by Paint Bulletin No. 3. Bulletin No. 4 presents detailed methods for formulating colored aluminum coatings which may be brushed rolled or sprayed.

EPOXIDES

Two revised and expanded technical bulletins on epoxides are available from Chemicals & Plastics Division, Food Machinery and Chemical Corp., Dept. PVP, 161 E. 42nd Street, New York 17, N. Y.

Technical Bulletin No. 95 describes Dicyclopentadiene Dioxide, now available in development quantities from FMC. Dicyclopentadiene Dioxide is a difunctional epoxide that can be used both as a modifier of conventional epoxy resins and as a primary building block for an epoxy resin system. Uses of this reactive diepoxide in alkyd resins, as a plasticizer, and as an intermediate for producing protective coatings, surface active agents, pharmaceuticals and pesticides are listed.

Technical Bulletin No. 96 describes Limonene Dioxide, a material combining the reactivities of an internal and an external epoxy group in the same material. FMC offers Limonene Dioxide in development quantities, and indicates its use as an efficient reactive diluent for epoxy resins and also as a primary building block for an epoxy resin system. Applications in alkyd resins, plasticizers, lubricant additives and chemical intermediates as well as chemical reactions are also outlined.

ATTAPULGUS CLAY

The typical properties of the company's line of Attapulgus Clay products are presented in a new bulletin recently published by the Minerals & Chemicals Corporation of America, Dept. PVP, Menlo Park, N. J.

Among the products described are Attasorb, Attaclay and Attagel—all highly sorptive, chemically inert, inorganic minerals capable of absorbing both acidity and alkalinity. The bulletin describes typical applications in adhesives, paints, plastics and other chemical applications.

The four-page bulletin, No. 1002, provides a typical chemical analysis of these Attapulgus Clay products and presents, in tabular form, the following properties of a total of 13 separate fine and granular products: free moisture content, ignition loss, bulking value, pH, color, specific gravity, residue, bulk density and surface area. A graph shows the particle size distribution for the complete line of products.

That's *fact* — proved in 5½ years exposure of test panels to Florida's hot suns and driving rains. House paints formulated with Dicalite stayed 'new-looking' far longer than similar paints without Dicalite. That's because Dicalite actually reinforces the paint film, makes a tougher more elastic film which holds tighter to the pigment particles. Results: less weathering, slower chalking, with practically no blistering, flaking or peeling.

If you would like more information on Dicalite in paint uses and the many advantages it gives — easy control of sheen, better leveling, improved brushability, clean whites and brighter colors, and reduced costs through extension of expensive prime pigments — just write, today, for Dicalite Bulletin C-23. It's free.

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PLASTISOLS

Plastisols and Organosols In Industry (Data Sheet No. 101) is offered as one of the first in a series of data sheets on vinyls, lacquers, synthetics, enamels and epoxies by by The Stanley Chemical Company, Dept. PVP, 401 Berlin St., East Berlin, Conn.

The printed six-page data sheet comes in its own special file folder so that such additional sheets may be added to the folder as they are released by the company.

Plastisols and Organosols In Industry covers the following subjects: definition, how they are compounded—resins, plasticizers, stabilizers, lubricants; how they are applied—slush molding, slush coating, dip coating, extrusion and injection molding.

SURFACTANTS

The Emulphogene BC family of nonionic surfactants are described and their properties discussed in a new booklet published by Antara Chemicals, General Aniline & Film Corp., Dept. PVP, 435 Hudson Street, New York 14, N. Y.

SILICONES

A new, eight-page catalog highlighting the major General Electric silicone products and their uses is now available from the Silicone Products Department, General Electric Company, Dept. PVP, Waterford, N. Y.

Designated as CDS-129A, this illustrated publication lists additional specialized literature covering product and application information as well as major G-E silicone products.

ETHOXYLATED CHEMICALS

A newly revised booklet on ethoxylated chemicals covering their chemical properties and widespread potential application has been prepared by the Armour Chemical Division, Dept. PVP, 1355 W. 31st St., Chicago 9, Ill.

The ethoxylated chemicals are made by combining ethylene oxide with fatty amines, amides or acids to form cationic or nonionic surface active agents.

The booklet covers the chemical structure of the Armour trademarked Ethomeen, Ethoduomeen, Ethofat and Ethomid products gives their physical properties and emulsification characteristics.

VISCOSITY DETERMINATION

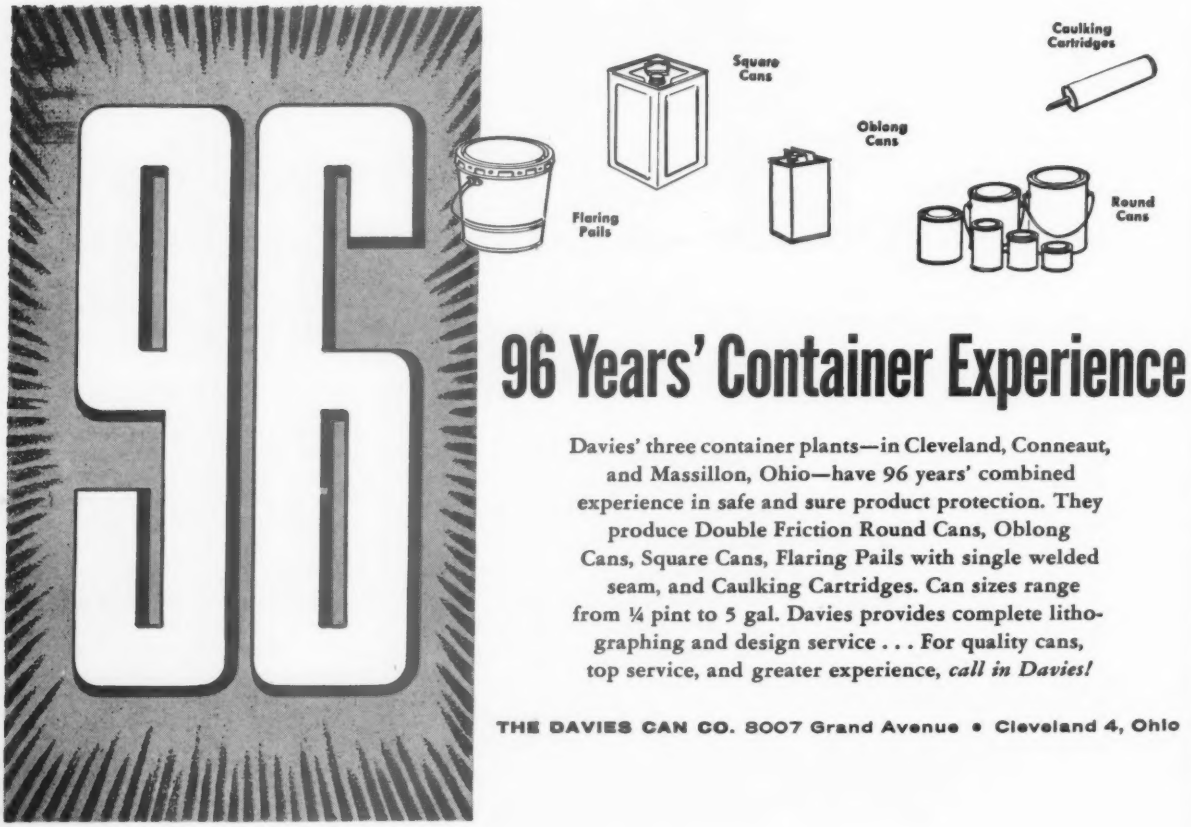
A new data sheet listing available reprints of technical papers on viscosity determination and control is available from Brookfield Engineering Laboratories, Inc., Dept. PVP, Stoughton, Mass.

The data sheet lists twenty-six technical papers on a variety of subjects and also lists several books on viscosity that are available.

INTERMEDIATE

Butynediol is the subject of a comprehensive review which has just been published by Antara Chemicals, General Aniline & Film Corp., Dept. PVP, 435 Hudson St., New York 14, N. Y.

The 40-page booklet presents the physical and chemical properties of butynediol and discusses its industrial applications. Information is also given on storage and handling of the chemical.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WATER REPELLENTS

Three new booklets devoted to silicone masonry water repellents are now available from the Silicone Products Department, General Electric Company, Dept. PVP Waterford, N. Y.

Booklet CDS-118A, *Guide Form Specifications to Help You Specify an Effective Silicone Masonry Water Repellent*, describes the common effects of water penetration and how silicone water repellents provide the answer to masonry damage. Also included is a standard guide form for specifying materials and application procedure.

Booklet CDS-120A, *Save Maintenance Dollars with Silicone Masonry Water Repellents*, describes how silicones offer economical masonry protection and reduce maintenance costs.

Booklet CDS-121A, *Increase Your Profits by Applying Silicone Masonry Water Repellents*, is specifically designed for the painting and waterproofing contractor.

GEAR & FLUID DRIVES

Information on the line of standardized gearmotors, motogears and fluid drives has been combined into one new 48-page book now available from Link-Belt Company, Dept. PR-PVP, Prudential Plaza, Chicago 1, Ill.

Book 2747, *Gearmotors, Motogears and Fluid Drives*, describes the functions of these various types of drives and provides detailed selection data, dimensions, overhung load ratings and mountings. It also lists such accessories as couplings, backstops and slide rails.

Detailed engineering and selection data, with service classifications and application information is contained in Book 2747.

SILANES

Detailed information on 24 silanes now being offered by Silicones Division, Union Carbide Corp., Dept. PVP, 30 East 42nd Street, New York 17, N. Y., is available in an illustrated 16-page booklet with tables. It can be obtained by asking for form SF-1160.

The physical properties, product specifications, and shipping data are listed in tables. Chemical properties and applications are also described.

HIGH ALCOHOL

A number of uses for 2,6,8-trimethyl-4-nonanol are described in a new four-page bulletin just issued by Union Carbide Chemicals Company, Dept. PVP, 30 E. 42nd St., New York 17, N. Y.

Typical reactions, properties, specifications, shipping data, and data on constant boiling point mixtures are detailed in the bulletin.

VISCOSITY EQUIPMENT

The Norcross Corp., Dept. PVP, 247 Newtonville Ave., Newton 58, Mass., has made available a bulletin describing its viscosity equipment control for automatically adding solvent to correct for evaporation losses.

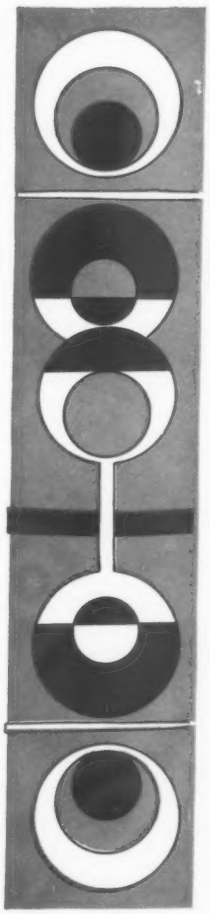
Designated No. V-1224, the bulletin outlines the viscosity control system for adding solvent. System components, principle of operation, and benefits of solvent control are listed.

Installation and recording controlling for multiple tank applications are also discussed.

PVAc POWDER

A bulletin on Vinac RP-250 redispersible polvinyl acetate powder has been made available by the Colton Chemical Co., Dept. PVP, 1747 Chester Ave., Cleveland 14, Ohio.

Specifications, formulations, evaluations, and test results are included.



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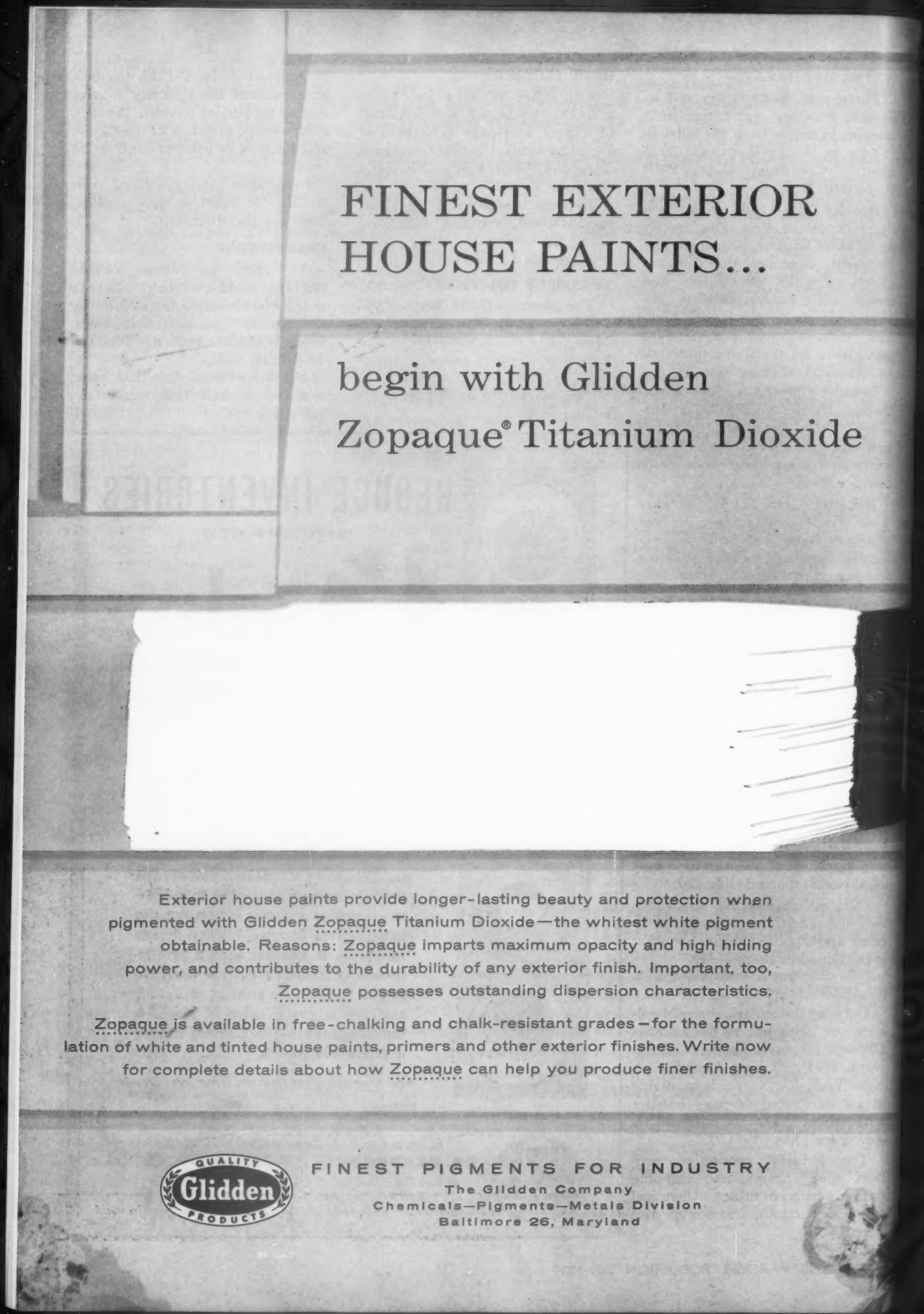
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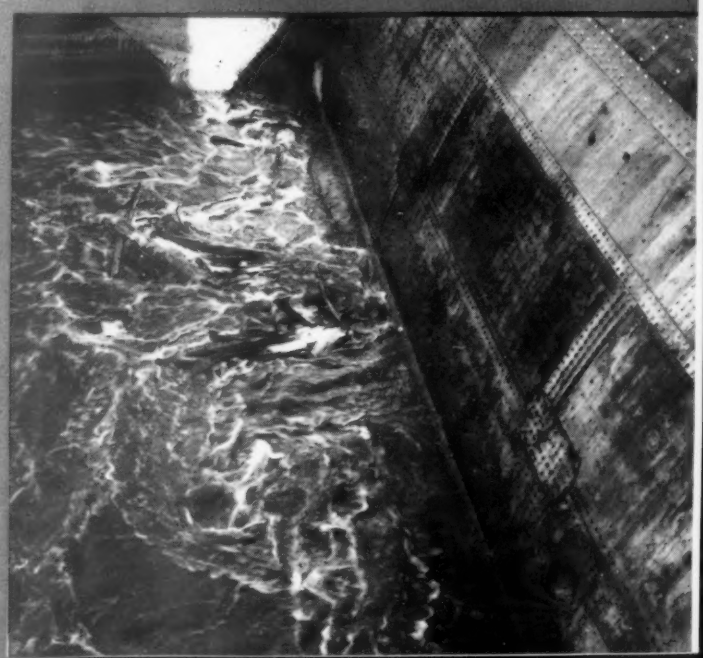
foreign developments

Zinc Dust Paints

Soviet and Polish Abstracts

Steel surfaces subjected to water immersion are particularly prone to corrosion attack. In England, zinc dust paints have shown considerable success in combatting corrosion. Turn to page 79.



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ZINC DUST PAINTS

Twenty years of research at Cambridge University paved the way for large scale commercial development of a corrosion-inhibiting paint.

ZINC dust has been known for more than 100 years[1] as a pigment which in paint is able to give protection against metal corrosion. However, the development of zinc dust paints on a commercial scale has had to await the formulation of a suitable binder since the alkaline chemicals, produced when the zinc dust is sacrificed to protect the metal, had an adverse effect on the paint media available at the turn of the century.

In the 1920's an Englishman, F. C. Dyche-Teague, made up a low viscosity chlorinated rubber for use as binder for paints and thought it ideal for zinc dust. *Detel Products Ltd.* was formed to market zinc-rich and chlorinated rubber paints. This company had no competitors in this field up to 1938. Their anticorrosion products gained considerable publicity when used on a number of steel yachts and for other protective purposes.

Full scale theoretical and experimental work on the precise nature of the anticorrosion effect and the conditions under which zinc dust was most effective began in 1941. The work was carried out by *J. E. O. Mayne, U. R. Evans* and their co-workers in the Corrosion Research Section of the Department of Metallurgy at Cambridge University within the framework of a research program of the Corrosion Committee of the Iron and Steel Institute, subsequently taken over by the British Iron and Steel Research Association. It was during these war years that the fundamental nature of the action of zinc dust was fully established. The upsurge of interest in zinc-rich paints after the war stems from this research and forms the basis of all modern ideas on the subject.

Requirements

In setting out the requirements for the use of metallic pigments, it was found that a pigment could only function when it met the following three conditions:

(a) The particles of pigment must be in metallic contact with each other.

(b) The particles must be in metallic contact with the steel base which is coated.

(c) There must be an electrolytic conductor (e.g. water with a trace of salt or acid) to complete the circuit between the two dissimilar metals.

Only zinc dust or powder was found to meet these standards. In the first experiments in the Corrosion Research Program, zinc dust was one of four pigments made into coatings with (a) chlorinated rubber, (b) polystyrene, (c) linseed oil, (d) medium stand oil and (e) an aqueous linseed oil emulsion. The paints based on linseed oil and the stand oil, containing about 95% zinc dust, were too thick for brushing and had to be applied with palette knife. After drying, the films were scratched and the coated panels were immersed in sea water. Within 20 months two main facts have become clear: linseed oil paints of all types had failed and the protection offered to bare steel at the scratch by the zinc dust paints had become obvious.

In order to explain the effect at gaps in the paint coating, electrical measurements were made[2] using films applied over the surface of two metal blocks separated by a fibre sheet. The specific resistance at 95% zinc dust content was found to vary from 0.27 to 0.06 megohm.cm; when the films only contained 86% zinc, the resistance was about 20 times higher. When this fact of good electrical conductivity was coupled with further measurements showing that zinc dust films applied over weathered rust eventually established metallic contact with the steel base (possible by reduction of the iron), the way was clear

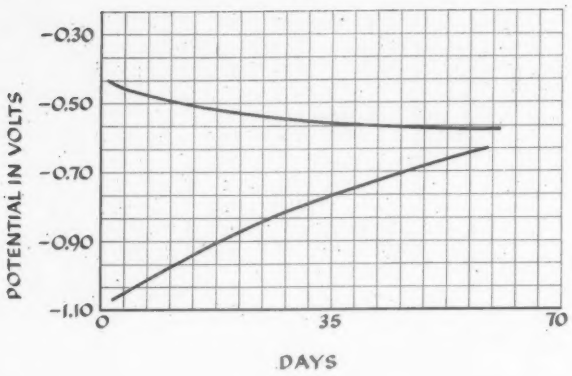

Figure 1. Specimens with varying surface conditions were either partially immersed in sea water directly or first provided with a coating of zinc dust paint. Potentials were measure at various intervals.

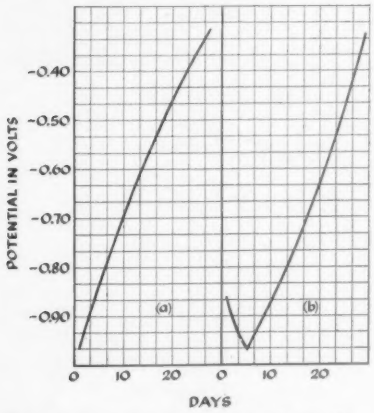

Figure 2. A comparison of the behavior of panels where zinc dust paint was applied over (a) pickled surfaces or (b) rusty surfaces which have been wire brushed. The potential decreased to minimum after 1 to 2 days.

for the formulation of an electrochemical theory of this particular behavior of the zinc pigment. The theory is still the subject of much argument and experimentation[3], but it is certain that zinc hydroxide or basic zinc chloride is rapidly deposited from the coating onto bare steel, preventing further corrosion.

The general trends which appeared during the measurements of potentials are shown Figures 1 and 2. In sea water immersion tests (figure 1), painted and unpainted panels were used for comparison. It can be seen that the potentials of rusty panels decreased slightly to reach a fairly constant level of the iron potential. On the other hand, the potential of the panels painted with zinc dust — polystyrene paints rose steadily from the zinc potential to the iron potential. In Figure 2 it is possible to compare the behavior of panels where the zinc dust paint was applied over (a) pickled surfaces or (b) rusty surfaces wire-brushed to remove loose flakes. Where the surface was rusty, the potential first decreased to a minimum after 1 to 2 days, presumably because open pores became blocked with corrosion products. The zinc also made contact with the steel through the rust and the potential is that of pure zinc. In all the figures, the general rise in potential is attributed to the attack and reaction of zinc dust so that metallic contact is lost. However, it was found that the paint did not fail then because by that time, the steel surfaces were protected by zinc hydroxide or carbonate.

In the course of this work it soon became apparent that polystyrene was the binder for zinc dust which gave by far the best results. Dr. Mayne accordingly examined an unpigmented film of polystyrene painted on steel and immersed in sea water[4]. From his results he put foward the theory that polystyrene films interpose a highly ionic resistance between the anodic and cathodic areas of iron, reducing the corrosion current. This resistance is gradually broken down and corrosion increases unless checked by other means, i.e. the zinc dust.

This same polystyrene binder (15 g of polystyrene, 5 g of Aroclor 1254 and 8 g of xylene) was subsequently used to examine the ability of zinc dust to make contact through a layer of rust on steel panels. The panels were pickled or the rust allowed to weather for a year or weathered for a year and wire brushed before the paint (500 g of zinc plus 100 g of binder) was brushed on[5]. These experiments gave clear evidence of the formation of points of contact even through very heavy continuous rust present on the surfaces. Generally, penetration of heavy rust is poor and the paint film flakes.

The question of the ability of zinc dust to cover rusty surfaces raised so many interesting questions that two more series of tests were made, one extending for 6 to 7 years involved two coat systems where zinc dust paints acted as primer, the other lasting about 4 years; zinc dust paints being used alone. Of Course, the view nowadays is that every possible trace of rust should be removed before painting but it is interesting to find Mayne reporting[6] that single coats of zinc-rich polystyrene paint were in good condition after nearly 4 year's exposure, provided that the initial rust was not more than 6 months old. Very suprisingly the results varied, according to whether painting was carried out in June or December. It is thought that the difference could be due to atmospheric pollution.

If steel panels with intact mill scale were weathered before painting for short periods, they tended to break down locally after painting but when weather for 9 months, the films behaved well, like weathered pickled samples. In the two coat system, iron oxide in linseed oil was found to be the best sealer for zinc-rich films, better in fact than red lead in linseed oil. Where two coats were applied over rust it was also found that good protection was only obtained when painting was done in summer.

Like all exposure tests, the main experimental factor is time and it is believed that some of the painted panels are still on the roof of the Cambridge Laboratory. Perhaps more will be heard of them. The recent flood of literature on the subject has tended to obscure this earlier work and due recognition should be given to it.

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5. J. E. O. Mayne, JISI, 1954, **176**, 140-43.
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SOVIET and POLISH ABSTRACTS

Carbochain Polymers and Copolymers

By H. S. Kolesnikov & N. V. Klimentova, "Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskhikh," 11:1383-1387, November 1958.

Catalyst and activating agent were added to the solution of monomers in toluene, heated to desired temperature, followed (under stirring) by addition of alcohol and water. Solvent and non-reacted monomers evaporate, the catalyst partially decomposes and partially is also driven off. The filtered-off copolymer is washed with hot water and dried at 50-60°C. The contribution discusses the role of various factors (increasing the time of reaction, ratio of initial reactants, activator concentration, reactions temperatures) on the polymerization process of acrylonitrile and methyl methacrylate in toluene in the presence of tributylboron catalyst

•

Polyester Lacquers In Furniture Finishing

By S. V. Iakubovich & I. A. Nagorskaia, "Derevoobrabatyvaiushchaia Promyshlennost'," Vol. 8, 1:6-8, 1959

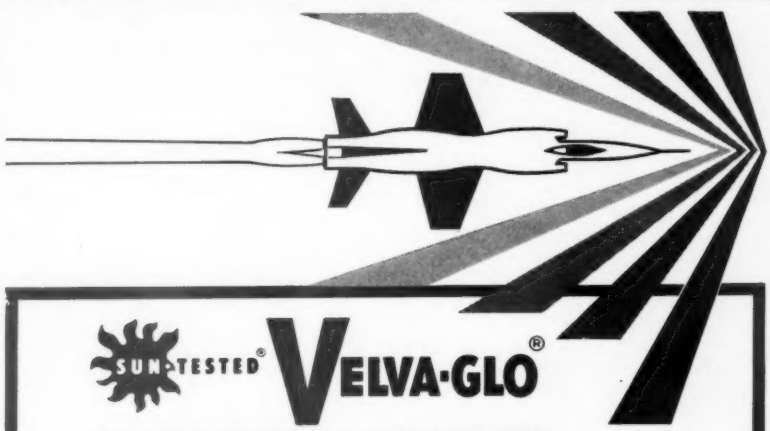
The use of polyester lacquers in the Soviet Union is in the beginning stage. GIPI-4, a new Soviet polyester lacquer, is a three-component product containing paraffin, and up to 95% film-forming substances. The paper tabulates its properties and compares them with those of Soviet nitrocellulose furniture-finishing lacquers, and of the English "Creston 200" product. GIPI-4, while superior to nitro-lacquers, takes up to 24 hours to dry. It is applied in two or three coats, by spraying at 2 atm. or using a special device permitting even application, and may be applied to horizontal surfaces only. A solution of polyester resin in styrene, diluted by acetone (1:1), is used as primer; lacquer application follows in 1-1½ hours.

•

Preparation of Lead Cyanamide

By V. Koutnik & V. Novak, "Chemicky Prumysl," Vol. 9(34), 1:18-22, January 1959.

Optimum conditions were determined for laboratory preparation of lead (II)-cyanamide of sufficient purity. Ammonia (10%) was added to two moles of free cyanamide (pH = 5, conc. = 4%) to alkalinity (corresponding to about pHll), followed by addition over 30 mins. and with constant stirring of one mole of $PbNO_3$ solution (conc. = 120g/1). The reaction was then allowed to proceed for another two hours, under constant stirring. The precipitate was decanted with water and washed. At optimum pH (over 10), the product has a clear lemon-yellow color, is crystalline (particle size about 10^{-3}mm), contains 10.95% of total nitrogen and 83.10% lead. The optimum drying temperature range is 60-80°C; at temperatures of 90-140°C, the pigment turns darker but on cooling becomes lemon yellow again. Changes in pigment characteristics were studies in drying temperatures of 40-



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200°C and tabulated. Anti-corrosion coatings with lead cyanamide were found superior to those with cinnabar, partially because the former pigment has a lower density. The replacement of cinnabar by Pb cyanamide in such coatings is envisaged also for reasons of economy.

•

Fungicidal Nitrolacquers Based on Oxyterpene Resin

By L. L. Korshun, T. V. Trifonova, A. L. Piviatinskii, B. M. Bugali, & I. I. Shubina, "Derevoobrabatyvaiushchaia Promyshlennost'," Vol. 7, 11:1-2, November 1958.

A study of the stability of nitrolacquers prepared on the basis of resin-forming products of turpentine oxidation by atmospheric oxygen (oxyterpene resins, having fungicidal properties). The lacquers were found to resist the action of mushroom molds, and are stable in increased temperatures (28 ± 2°C) and in high relative humidity conditions (98%).

•

Improved Binder For Paints and Lacquers

By M. Saluda, (Radomska Fabryka Farb i Lakierow Przedsiebiorstwo Panstwowe), Polish Patent No. 38336, December 20, 1955, "Ref. Zhur. Khim.," 4:13837P, 1959.

Drying, semi-drying or non-drying oils are thickened by thermal polymerization or by passage of air at elevated temperature, with or without a catalyst. The oils are added into the vessel in turns, starting with the oil which condenses most slowly, and adding other oils during one hour until the necessary viscosity is attained. EXAMPLE: heat 300 kg linseed oil in a reaction vessel to 130°C, and subject it to passage of air (at this temperature). When the viscosity = 70°$_\epsilon$ (at 50°C), add 1,000 kg tung oil, heat to 130°C, and subject to air passage until viscosity = 120°$_\epsilon$ (50° C). Time of process: about 26 hours.

•

Method of Coating Sheet Iron

By A. Grosman, W. Szymanski, L. Inforowicz, J. Nowak, Z. Pajdowski, & Z Trzeciakowski, (Bydgoska Fabryka Opakowan Blaszanych Przedsiebiorstwo Panstwowe Wyodrebniowe), Polish Patent No. 39475, January 15, 1957. "Reg. Zhur Khim.," 4:13826P, 1959.

The lacquer coat follows the application of a primer. The primer is a solution of cresol-formaldehyde resin, modified by tung oil (tricresol to tung oil ratio, 1.5 : 2.25-2.5) and with Fe oxide (in amount proportionate to the amount of tricresol). The lacquer is a solution of phenol formaldehyde resin, esterified with butanol (phenol to butanol ratio, 1 : 0.75). After its modification with tung oil, the viscosity of the cresol formaldehyde resin = 530-600 sec (using Ford funnel No. 4, at 20°C); that of the phenol-formaldehyde-solution condensation product, 250-300 sec. Esterification with butanol is carried out at 130-135°C. EXAMPLE: Sandblasted sheet iron for conserving cans was first coated with primer, prepared by heating (with stirring) 150 parts (by weight) cresol (containing 28-30% *m*-cresol), 108 parts 40% formaldehyde solution, and 6 parts ammonia water (25% NH_3). The condensation was allowed to proceed for 30 min. beyond the moment when the mixture became turbid; the product's viscosity = 100-120 sec. Dried under vacuum (until a sample on glass plate was transparent), the resin was mixed with 150 parts butanol and 225-250 parts tung oil, headed to a viscosity of 530-600 sec. Following the addition of 350 parts iron oxide, the resin was diluted in xylene to viscosity = 20 sec. The primer, after application on sheet iron, was dried for 20 min. at 160-170° C. The finishing lacquer was prepared by heating, with mechanical stirring, 100 parts crystalline phenol, 81 parts 40% formaldehyde solution, and 4 parts

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ammonia water (25% NH_3), until the mixture became turbid; after cooling, the resin viscosity = 250-300 sec. Following the separation of water, 75 parts butanol was added, and the resin heated at 130-135°C, until some 50% of the butanol was driven off (without using a vacuum). After additional 70 parts of butanol were added to the mixture at this temperature, the resin was cooled and diluted to viscosity = 15-17 sec. The lacquer is applied by spraying, and dried for 15 min. at 200°C.

•

Preparation of Heat-Stable Electro-Insulating Lacquer

By J. Smoczynski,(Krakowskie Zakaady Wytworcze Materialow Elektrotechnicznych), Polish Patent No. 37537, February 1, 1956, "Ref. Zhur. Khim.," 4: 13824P, 1959.

The alkyd-based lacquer is prepared by reaction of monoglycerides (M) of linseed oil acids (obtained by heating lineed oil with glycerine) and phthalic anhydride (PA). The reaction between M and PA proceeds to completion at 160°C, then is allow to continue at 200° C until the acid number of the mixture is< 20. A modified phenolic resin (10-30%) is then added to the condensate. EXAMPLE: add 250 parts glycerine (b. p. 200°C) to 1000 parts of decolorized linseed oil, using 60-80 parts of M of linseed oil acids as catalyst, and heat at 250-270°C, to obtain the M. Heat 100 g M to 160°C, add slowly for one hour) 400 g PA, increase temperature during one hour to 240-250°C and heat for another two hours, until the resin's acid number< 20. After cooling to below 200°C, add 250 g of modified phenolic resin, and white spirit. The coatings from this lacquer possess good insulating and mechanical properties, and are durable.

•

Pigment Dispersion By Ultrasonics

By M. Gorska, "Przemysl," Vol. 38, 48-51, January 1959.

The paper deals with the effect of ultrasonics on the particle size of suspensions of pigments "Green B," "Phthalocyanin Blue B," and carbon black. During the experiments, the following parameters were subjected to change: intensity and time of ultrasonic irradiation, the disperser (liquid), the concentration and volume of sample, and the thickness of the bottom of the vessel which contained the sample. All of these parameters were found to affect the degree of pigment dispersion. The reaction of pigment suspensions to ultrasound varies with the pigment. A marked effect of ultrasonic irradiation was observed only with low-concentration (1%) aqueous pigment solutions. Particle size of the irradiated suspensions did not increase after several days' standing. The aim of the investigation was to prepare pigment suspensions of such a concentration and degree of dispersion as are approximately required for pigment suspensions for viscose dyeing in rayon manufacture. Positive results on laboratory scale were obtained only for pigments "Green B" and "Phthalocyanin Blue B."

•

Fast-Drying Plastic Material

"Morskoi Flot," Vol. 19, February 1959.

A fast-solidifying plastic material, based on epoxy resin ED-5, polyethylenepolyamine, glass fiber and asbestos, was developed at the Moscow Chemical Technology Institute. The plastics dries at temperature range of −10 to +30°C., in two hours at normal temperatures, or in up to 24 hours in sub-zero temperatures. It does not change its physical properties at 50°C. The composition of the material: 3 parts ED-5 epoxy resin, one part each fiber asbestos and glass fiber, 0.75 parts polyethylenepolyamine. The latter is mixed (by stirring for 5-10 min.) with the epoxy, then glass fiber and asbestos are added successively and in 3-4 portions each. The mixture is stirred until homogeneous, then it is ready for use. Some physical characteristics: compression strength = 1,220 kg/cm^2, tensile strength = 416 kg/cm^2, resilience = 18 kg/m/cm^2, linear contraction in time = 0.35-0.5%.

•

Cleaning of Ship Bodies With a Burner

By D. Chapkic, "Morskoi Flot," Vol. 19, 36-37, February 1959.

A burner, using a kerosene-oxygen mixture, is employed for the cleaning of metallic surfaces from paint. The mouth of the burner, mounted on two small wheels, is 200-300 mm wide, and permits to clean 15-20 m^2 of surface area in one hour. The burner, which is effective at all atmospheric temperatures, leaves the surface dry and warm. Schematic diagrams.

•

Methods of Old-Paint Removal

By E. V. Iskra, "Sudostroenie," Vol. 25, 2:52-53, February 1959.

An electrically heated metal scrubber, intended for manual paint removal in places where neither organic nor alkaine paint-removers can be used, is described. The chisel end of the scrubber, heated to 140-160°C., softens the paint. A 40 mm chisel permits to clean 1 m^2 of old paint in 20-25 min.

BUILT-IN FUNGISTATS

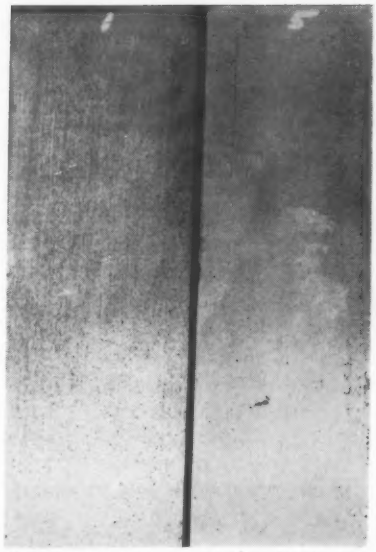
(*From page 46*)

deterioration, including mildew and film failure. The panels coated with the tung-tripropionin paint were rated superior to the control panels coated with the commercial paint. The same relative standing was reported after 18 months although at that time the yellow pine panels were rated fair to good instead of excellent. The mahogany panels coated with the tung tripropionin paint, after 18 months exposure, were rated "good, best of all," and were distinctly superior to the control panels which were rated dirty. Even better performance could be obtained by formulation for optimum pigment–volume–concentration.

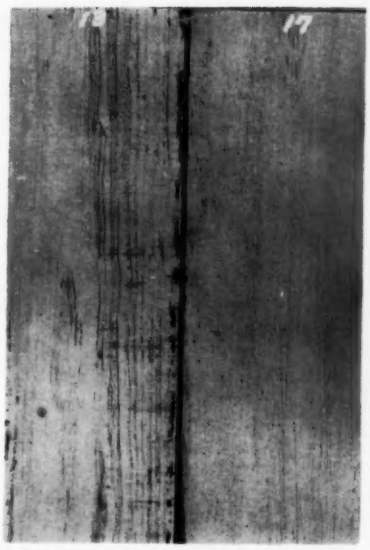
It is realized that results of short-term laboratory tests are not conclusive in evaluating protective films, but the prospect for the utility of built-in fungistatic components for vehicles for surface coatings is promising. Indications from panel exposure tests of tung-tripropionin based paint formulations are that this could well prove most fruitful for further study.

Acknowledgment

The assistance of Donald L. Wood in the preparation of the experimental vehicles is gratefully acknowledged.



White paints from vehicles with built-in fungistats after two years on an exposure rack at 45° facing South. The Philippine mahogany panels were primed with a base coat of outside white paint of good quality. The control on the left is a commercial house paint pigmented with lead, zinc oxide and titanium dioxide. The panel on the right was coated with a fungistatic vehicle prepared from 90% tung oil and 10% tripropionin and similarly pigmented.



White paints from vehicle with built-in fungistats after two years on an exposure rack at 45° facing South. Pine panels were primed with a base coat of an outside white paint of good quality. The control on the left is fume resistant house paint. For the panel on the right the vehicle was 85 % tung oil interesterified with 15% tripropionin and was similarly pigmented.

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WATER ABSORPTION

(*From page 35*)

cumulation and pressure development with blister formation is repeated. If the blisters are examined only at the final stage they will appear to start by loss of adhesion to the substrate. Although this does occur, it does not appear to be only cause of blistering or the primary site of blister formation.

This reasoning would account for obtaining practically the same type and degree of blistering shown in Tables 3, 4, and 5 on the three sets of coated panels which were dried for different time periods before testing in the salt-fog cabinet. Although longer drying produced greater hardness and strength in each coat of the paint systems it did not change appreciably the secondary valence forces between each coat. Obviously there are many factors which contribute to the extent of blistering. Coatings like linseed oil which have relatively less cross-linkages or primary forces have weak structures and do not blister as readily as resin coatings which contain many more cross-linkages for a given area. Also, the specific adhesion between certain resin coatings may be so strong that water does not accumulate at the interface but permeates to the substrate and blisters may form from loss of adhesion.

Subsequent to this work an observation was made on an exterior house paint system on wooden panels in a blister box test. Of course, in this case the moisture passing through the coating comes from the box and through the wood. Typical blisters developed which split open revealing the bare wood indicating that moisture had accumulated between the wood and the coating followed by loss of adhesion and blister formation. However, examination of blisters that had not split open revealed that the blisters were in the finish coat and the primer was not affected. This indicates that the combination of mechanical and specific adhesion to the wood was stronger than the resistance of the coating; therefore moisture permeated to the interface between the two coats. Here it accumulated and blistered the finish coat. However, continued permeation through the wood weakened the adhesion of the primer and the final blister condition developed which cracks and reveals bare wood.

It is believed that tests on paint systems made with modifications of the new transmission cell described in this paper together with an apparatus such as the diffusion cell described by Kittelberger (4) would serve to further elucidate the phenomenon of blistering and moisture transmission through coatings.

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David M. Borcina Addresses Lead Association Meeting

David M. Borcina, assistant to the secretary of the Lead Industries Association, addressed the Association's 31st annual meeting held recently in Chicago.

He expressed optimism for a new wetting additive for rust-inhibiting red lead paints to be used on steel surfaces. He said that the new additive was currently on field test under the Association's program for the development of improved paints and paint materials.

"This field testing," Mr. Borcina said, "is in line with our attempts to develop a vehicle that will wet the steel as well as or better than linseed oil, without the slow-drying characteristics of linseed oil. We are very optimistic about the wetting additive on test, but only actual field tests can eventually justify our optimism.

"The problem to date with the faster-drying vehicles currently available is the necessity for careful preparation of the surface to be painted, because of their poor wetting characteristics.

"Such preparation generally involves sand or shot blasting to remove all traces of mill scale and rust. With a linseed oil vehicle, because of its excellent wetting characteristics, the need for such careful surface preparation is not so important, generally requiring only wire brushing to secure good adhesion."

New Trend In House Paints

As to house paint formulations, Mr. Borcina called attention to a trend, that he said it was hoped would "develop to major proportions," to increased use of "for-

David M. Borcina

mulations incorporating the newer lead pigments, such as basic silicate white lead, with conventional white lead.

"This type of pigment mixture," he said, "has the decided advantage of lower cost while maintaining a high level of performance.

"We have found that one of the major obstacles to the expanded use of the conventional lead pigments, such as straight white lead or red lead, is the high initial cost. It is therefore hoped that the newer lead silicate types of pigments and new mixed pigment formulations, which the Lead Pigments Technical Committee feels have considerable merit, will lower the cost of our products and expand the use of lead in paints."

Improved Machinery Enamel Sought

He said the Association's latest paint project "will investigate the feasibility of providing a rust-inhibiting, one-coat machinery enamel for new and maintenance painting of highway, farm, and other equipment." Paints to be tested in this connection may be placed on exposure this summer, he said.

"In this project," he explained, "another lead pigment, lead chromate, as well as the silico chromate, will be thoroughly investigated. Paints for machinery enamels formulated with lead chromate are currently being used in a few states, notably Ohio."

For Heating, Refrigeration Equipment

Lead compounds applied as paints or porcelain enamels "may find widespread use in heating and refrigeration equipment," Mr. Borcina told the meeting, if "final results confirm earlier data" based on a preliminary study that "indicates that the use of lead compounds applied to metal surfaces greatly increases the heat emission and dissipation of the base metal."

Marine Paints Improved

On the Association's development of an improved paint for ship bottoms (L. I. A. 328), Mr. Borcina reported that "the U. S. Navy tested this paint on three destroyers and found it as effective as a far more expensive lead-free paint that they are currently using. This paint contains three and one-third pounds of red lead per gallon."

Protecting New Galvanized Iron

"Another development," Mr. Borcina continued, "was a red lead, iron oxide, zinc dust paint for rusted, weathered, or treated new galvanized iron. This paint has shown up exceptionally well after almost seven years exposure. It contains almost four pounds of red lead per gallon and is the first instance of a single paint that has been developed for galvanized surfaces regardless of their condition.

"Throughout our field test program, we are constantly testing and evaluating the anti-corrosive paints containing 100 per cent red lead. The use of such paints is still standard practice among most of the state highway departments and other large users of anti-corrosive paints. Our efforts here have been aimed primarily to reduce the drying time, and in this we have been successful."

NEWS

NEWS OF COMPANIES, ASSOCIATIONS
TECHNICAL GROUPS
ITEMS OF GENERAL INTEREST

AZI Pigments Committee Panel

Important highlights of the latest industry-wide exterior house paint research program will be reported and discussed this fall by a five-member panel representing American Zinc Institute's Pigments Committee, according to John L. Kimberley, executive vice president of the Institute.

Entitled *Paint Exposure Work by American Zinc Institute*, the report is scheduled for presentation to leading paint and varnish production clubs across the nation.

The presentation will include a progress report by AZI's Expanded Research Program director Schrade F. Radtke, who will describe highlights of the project. This will be followed by an open session during which the Pigments Committee panel members will answer questions from the audience, drawing on results of these tests and their long experience as representatives of the five leading and competitive suppliers of zinc oxide to the paint industry, Mr. Kimberley noted.

On stream as of August, 1958, the project—one of many in AZI's expanded research program—is the broadest industry-wide program thus far designed to investigate all types of conventional exterior house paint formulations, declared Mr. Kimberley.

With special emphasis on the role played by zinc oxide, thousands of panels are being used in the tests, representing the latest paint types, pigment formulations, and vehicle developments, said Mr. Kimberley. Purpose of the tests is to confirm and strengthen knowledge of paint reactions to the sun, sea air, industrial and city smoke. Results will indicate the best levels of zinc oxide for improved tint retention, durability, non-chalking action, and resistance to mildew, he stated, noting that the test includes sites representing a cross-section of weather types across the nation.

The Pigments Committee panel will consist of representatives of American Zinc Oxide Company, Columbus, Ohio; The Eagle Picher Company, Cincinnati, Ohio; New Jersey Zinc Company (of Pa.), Palmerton, Pa.; Sherwin-Williams Company, Chicago, Ill.; and St. Joseph Lead Company, Monaca, Pa.

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McNeer Anniversary

A quarter of a century of service with The Goodyear Tire & Rubber Company was observed recently by C. O. McNeer, general sales manager of the Goodyear Chemical Division.

The occasion was marked when McNeer received a 25-year service emblem from H. R. Thies, division general manager, during a sales conference dinner. Home office sales personnel, district managers and foreign representatives of the Goodyear International Corporation's Chemical Division were present.

•

Nopco Acquires Wolf

The Nopco Chemical Company has announced that it has acquired all the capital stock of Jacques Wolf & Company, Clifton, N. J., in a cash transaction. The purchase price—more than $3,000,000—did not exceed the net worth of Jacques Wolf at the time of purchase. Wolf's annual volume of sales has been between $5-6,000,000 for the past five years.

Nopco will operate Jacques Wolf as a wholly-owned subsidiary, retaining its present staff and sales force. G. J. Desmond and Arnold Pfister, Wolf officers, will continue to serve in their present capacities, while G. Daniel Davis, Nopco executive vice president, becomes president of Jacques Wolf.

Jacques Wolf salesmen, many of whom are long-time employees of the company and experienced in the field, will remain as Wolf representatives in their established territories.

•

Paint Introduced

Preservative Paint Company of Seattle has introduced in the Pacific Northwest a new patented white house paint with Busan 11, said to be a proven ingredient for resisting mold, stains, peeling and blisters.

The manufacturer points out that discovery of Busan 11 was made after tests of hundreds of compounds on paint test fences of Buckman Laboratories at Memphis, Tenn.

Known as barium metaborate monohydrate, Busan 11 enables the controlling of two most common forms of paint failure—unsightly blistering and peeling of the paint film and the growth of mold (mildew) on the paint causing a dingy appearance.

BIENNIAL SYMPOSIUM: Viewing exhibits at the recent Sherwin-Williams technical symposium are, left to right, Arthur B. Holton, technical director for the paint firm; Daniel M. MacMaster, director of the Museum of Science and Industry, Chicago; and Alan F. Clifford, associate chemistry professor, Purdue U.

NEWS

Paint Indsutries' Show Of 1959 Over The Top

With more than 90% of the available exhibit area already reserved and applications for space still coming in, the Paint Industries' Show of 1959—to be held in Atlantic City from October 20 to 24—is an assured success.

Members of the Federation of Paint and Varnish Production Clubs, and visitors to the Show will have an opportunity to see the latest developments in equipment and materials and to discuss their problems with outstanding technologists and engineers associated with the above firms.

The exhibitors this year will get a bonus of extra exhibit time and a larger audience because the Show will be opened to members of the National Paint, Varnish and Lacquer Association whose convention will be held in Atlantic City from October 19 to 20. The Show, which will be held in the Lower Level of Convention Hall, will be opened to the executives of the paint industry on October 20 from 4-7 P. M. and on October 21 from 2-6 P. M.

The official opening of the Show for members of the Federation will be on October 22 at 9 A. M. It will close on Saturday, October 24.

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Reichhold Production

Reichhold Chemicals, Inc., is starting production of polyvinyl acetate and acrylic emulsions at its Jacksonville plant, it has been announced.

In addition to the expanded production facilities, the plant has also been equipped for bulk storage of polyvinyl acetate emulsions and alkyd resins, also used by paint manufacturers. Further, a tank wagon has been specially equipped to make combination shipments of these two important products to RCI customers.

The Jacksonville plant, which is located at West Beaver Street and Wamsley Road, will continue to produce Plyamine urea formaldehyde and melamine resins for the furniture, plywood, and paper manufacturers in the southeast.

•

Companies Merge

The managements of A. E. Staley Manufacturing Co. of Decatur, Ill., and U B S Chemical Corp., of Cambridge, Mass., have agreed on a merger of U B S into Staley on the basis of the exchange of one share of common stock of Staley for each one and three-quarter shares of common stock of U B S. The preferred stock of U B S is to be retired prior to the merger.

The merger will require the issuance of approximately 102,000 shares of Staley common presently authorized but not outstanding.

Consummation of the merger is contemplated for this summer and is subject to approval of the stockholders of both companies and to completion of legal and other studies now underway.

•

Allied Acquires Harmon

Allied Chemical Corp. has completed negotations with The B. F. Goodrich Company for acquisition by Allied of the business and assets of Harmon Colors, Chester M. Brown, president of Allied's National Aniline Division, has announced.

Harmon Colors, a leader in the field of specialty organic pigments for 40 years, has been part of B. F. Goodrich Chemical Co. division. Harmon produces organic pigments for automotive finishes, paints, textiles, rubber and plastics, printing inks, and flooring. Headquarters, laboratories and manufacturing facilities are located at Haledon, N. J.

Harmon operations will continue as a unit under National Aniline's supervision. Its pigments will be marketed by the existing Harmon sales organization under the Harmon Colors tradename from its present general sales offices at Haledon. Management will remain under the direction of V. C. Vesce, technical director, H. T. Madden, plant manager, and F. F. Bingham, sales manager.

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C. Howard Reeder Passes

C. Howard Reeder, chairman of the Board of Baltimore Copper Paint Company, died recently.

Mr. Reeder had been active for more than 55 years in the management of Oliver Reeder and Son, Inc., proprietors of Baltimore Copper Paint Company.

NUODEX AWARD: James P. Wood, Jr. receives the Nuodex Award from Professor Henry F. Payne at the University of Florida. Dr. W. H. Beisler, center, is head of the Chemical Engineering Department in which the paint courses are given. Mr. Wood did excellent work in the paint courses and he is listed as an honor student by the Dean of the College of Engineering. He has worked in the paint industry during summer vacations and he expects to become affiliated with the industry after graduation in June 1960.

NEWS

Flax Institute Sets Convention

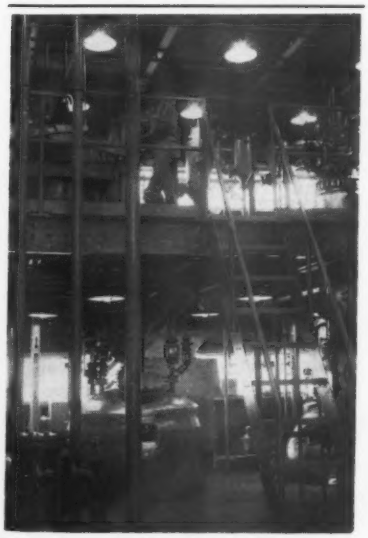
The Flax Institute's 29th annual fall convention, including for the first time a production school for farmers and county agents, will be held November 19-20 in Fargo, N. D.

Institute officals said that the "grower day"—to be moderated by Dr. J. O. Culbertson, director of oilseeds and industrial crops research at the U. S. Department of Agriculture Beltsville, Md., station—will include production research reports by USDA and agricultural college agronomists, discussions of feed and paint industry flax research programs, and question-and-answer sessions in which growers will receive advice regarding specific on-farm problems.

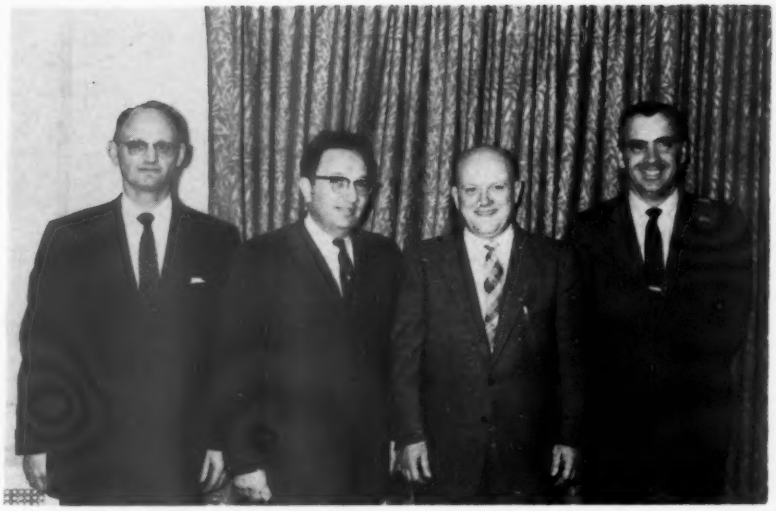
"We hope to condense into one, fast-moving day all the new production techniques and research projects of interest and value to the flax producing farmer," said Charles E. Morris, secretary of the Flax Development Committee, sponsor of the Flax Institute. "Each man should leave the meeting better informed on how to make flax an even more consistently profitable crop."

First day of the convention will be devoted to a technical committee meeting, Morris said, during which representatives from area agricultural schools will meet to review present flax research programs and to plan new projects.

"Both meetings should help forward the Institute's goal of expanding the market for farmers' flaxseed," Mr. Morris added.



POLYMER PLANT: Interior view of A. E. Staley Manufacturing Company's new polymer plant shows portion of complex systems and equipment required for conversion of synthetic monomer chemicals into acrylic emulsions.



N. Y. CLUB OFFICERS: Ben Chatzinoff (second from left) has been elected president of the New York Paint & Varnish Production Club. Other officers elected were Raymond L. Whitney (left); Edward A. Fischer (second from right); and John J. Oates.

•

Emery Moves Office

The Chicago office of Emery Industries, Inc., has moved to new quarters at 6835 West Higgins Ave., Chicago 31, Ill. The new telephone number is Rodney 3-5747.

Emery's present warehousing operation in Chicago will continue unchanged.

The office will serve as headquarters for Joseph E. Quinty and Paul N. Leech, sales representatives for Emery's Organic Chemical and Fatty Acid Sales Departments, respectively, in a five-state territory surrounding Chicago.

•

Connolly Honored

Frank P. Connolly, president of John W. Masury & Son, Inc., was honored with the Merit Award at a recent meeting of the Inter-county Paint and Wallpaper Dealers Association, Inc., in Brooklyn, N. Y.

Sid Beyer, executive secretary of the Association, in his presentation ceremony said the Merit Award is the highest honor that the Association can give to anyone. In twenty-eight years, it has been awarded only four times.

The inscription on the award reads: "In recognition of many years of unselfish, faithful, constructive devotion and loyalty to the Paint Industry, may you, by your continued and valued good work, maintain those ideals which have for these many years served as an inspiration to all others."

•

Resins Production

Full commercial production of polyester and alkyd resins in newly erected facilities at the A/S Danske Oliemoller OG Saebaefbrikker plant in Copenhagen was jointly announced by the Danish firm and Schenectady Varnish Company, Inc., of Schenectady, N. Y.

This is the first production of these resins in Denmark, the country's requirements previously being imported from other European countries. They are being made under special license from the Schenectady concern and include a complete range of polyester resins for use in reinforced plastics, as well as alkyd resins for use in protective finishes.

The arrangement gives Oliemoller exclusive rights to the manufacture and sale of these Schenectady resins in Denmark and neighboring Scandinavian countries.

NEWS

Bright Future For Turpentines

Predicting that the pulp industry "will be the principal source of turpentine long before 1975," a speaker at a meeting of the Pulp Chemicals Association said that technology is opening new directions to turpentines.

Ernest E. Holdman, former vice president and general manager of the International Division of Heyden Newport Chemical Corp., traced the history of naval stores in the United States for members of the Association's Sulphate Turpentine Division, and told them that today's terpene specialist can develop the expanding markets needed by the growth of sulphate wood turpentine—a paper industry by-product—as a raw material.

Quoting industry figures, Mr. Holdman, well known in the Naval Stores industry for over 50 years, pointed out that sulphate wood turpentine accounts for more than 50 per cent of the crude turpentine produced in the U. S. yearly. He said that the "great bulk of it goes into the manufacture of terpene based chemicals and there is room for more." Continued terpene research has led to the development of perfumery components, for example, and flavoring materials such as menthol, thymol and meomenthol, with newer products for insecticides, rubber chemicals and plastics forecast.

In reviewing the history of naval stores, Mr. Holdman identified the term as "one of the oldest industries in America, if not the oldest."

"As long as industry keeps recovery in high gear and its idea of values within reach of the processor", Mr. Holdman stated, "sulphate wood turpentine can be consumed right here at home in the forseeable future and need not compete in the world markets with Russian, Chinese or any other origin turpentine."

•

United Carbon To Move

United Carbon Company, whose principal offices have been located in Charleston, W. Va., since the formation of the company 35 years ago, shortly will begin the gradual transfer of its executive and departmental headquarters to other cities.

According to president R. W. French, United Carbon's executive offices will be moved to Houston, Texas; the marketing headquarters will shift to New York City; and remaining departmental headquarters will go to Houston.

The Appalachian Area office of the company's gas and oil division, which has been considerably expanded in recent years, will be retained in Charleston.

•

Carbide Distributors

Union Carbide Plastics Co., Division of Union Carbide Corp., has made distributorship arrangements with two companies to strengthen its sales and service activities in the protective coatings industry, it has been announced.

Distributors appointed by the plastics company are H. D. Litter Co., Inc., of New York, and Harry A. Baumstark and Co., St. Louis. Both companies will sell Bakelite Brand vinyl acetate latex, vinyl solution resins and phenolic resins. Bakelite Brand resins for coatings will continue to be sold and serviced in these areas by Union Carbide Plastics representatives.

NEW PECORA PLANT: Assembled around earth mover at Pecora, Inc. ground breaking ceremonies for new plant at Garland, Texas, are, left to right, George Connell, general contractor, Connell Construction Company, Dallas; Robert White, Dallas architect; W. C. Miller, Dallas City councilman; William Bole, of Pecora's Dallas plant; and Ernest S. Wright, Jr., Mayor of Garland.

D. L. Boland Dies

Daniel Llyng Boland, general counsel for the National Paint, Varnish and Lacquer Association, died recently of a heart attack. He was 56.

Mr. Boland was graduated from Scranton University with a B. A. degree and founded the Scranton University Alumni Association in Washington and was its first president. He received his law degree from Harvard Law School and was a member of the John Carroll Society of Washington.

•

Celanese Names Palmer

Palmer Supplies Co. of Cleveland has been appointed sales representative in Northern Ohio for Celanese Corp. of America's polyvinyl acetate emulsions, used in the manufacture of water-thinned paints.

Fred Palmer, president of the company, and Sheldon Rose will service Celanese emulsion accounts. Mr. Rose formerly was associated with Arco Paint Co. and Empire Varnish Co. The emulsions will be stocked in Cleveland for quick delivery to paint manufacturers.

•

Esco Name Change

The Esco Laboratories has changed its name to Edward C. Scholl Laboratories, effective June 1, it has been announced.

PERSONNEL CHANGES

AMSCO

Donald J. McIntyre has been appointed manager of the Northern division, it has been announced.

D. J. McIntyre

Mr. McIntyre succeeds the late **Clyde C. McInnes,** who died recently.

Mr. McIntyre joined the organization six years ago as a technical representative in the New York and New Jersey area. In 1955, he was promoted to manager of the company's sales office at Baltimore.

ACME SHELLAC PRODUCTS

Howard W. Kelting has been appointed sales manager, it has been announced.

Mr. Kelting has been associated with the industry for the past 27 years.

His first undertaking will be to reorganize the orange flake shellac department. Mr. Howard will also continue to serve his many customers on confectioners and pharmaceutical glaze, esterified shellac, and bleached grades.

A. C. HORN

W. J. C. Bond has been appointed plant manager in charge of all manufacturing facilities of the Canadian operation, it has been announced.

Mr. Bond obtained his Bachelor of Science degree in Honour Chemistry at the University of Toronto.

Mr. Bond is a chemist, technician and has had extensive experience in the field of paints, varnishes, and finishes; their formulation and production.

MICHIGAN CHEMICAL

George C. Stradley has joined the corporation as group leader in charge of chemical engineering research, it has been announced.

With E. I. DuPont de Nemours & Co. from 1937 to 1958, Mr. Stradley held chemical engineering positions in connection with a wide range of chemical process developments. During his years with DuPont, he also was production supervisor in the manufacture of dyes, dye intermediates, detergents, neoprene, and other chemical products.

Mr. Stradley graduated from the University of Delaware in 1937.

GENERAL ANILINE

J. Robert Bonnar has been appointed director of marketing and **Dr. Chapin E. Stevens** has been named director of commercial development, both for the Dyestuff & Chemical Division, it has been announced.

In his new position, Mr. Bonnar will have direct supervision of all sales and related marketing functions of the division.

Prior to this appointment, Mr. Bonnar was sales manager—Dyestuffs, a position he had occupied since 1953.

He graduated from Massachusetts Institute of Technology in 1927 with a B. S. degree in Chemical Engineering.

Dr. Stevens has been manager of sales development of the Division in New York City since 1956.

In his new capacity, he replaces **Dr. Jesse Werner,** recently appointed a vice president.

DEWEY & ALMY

A. V. Baracani has joined the firm as organic chemicals sales representative in Chicago, it has been announced.

Mr. Baracani will sell vinyl acetate polymers and copolymers, butadiene-styrene resins and latices, plasticizers, and dispersing agents in Illinois, Indiana, Iowa, Missouri and Nebraska.

He was most recently with Advance Solvents and Chemical Division of Carlisle Chemical Works, Inc., and has also served with the Carl Lechner Co. and Nox-Rust Chemical Corp.

John-Basil Yannas has joined the company as a chemist, in the organic chemicals research laboratory, it has also been announced.

He received an A.B. in chemistry and French literature from Harvard in 1957 and an S.M. in Chemical Engineering from the Massachusetts Institute of Technology in 1959.

MORNINGSTAR-PAISLEY

Murray Stempel has been elected president, it has been announced. He succeeds **George J. Muller,** who has been elected vice chairman of the Board.

Mr. Stempel has been associated with the company for the past 35 years. When Morningstar, Nicol, Inc. merged with Paisley Products, Inc. early in 1957, Mr. Stempel was elected executive vice president of the combined operations.

A. GROSS

Ralph O. Williams has joined the sales staff, it has been announced.

He will make his headquarters in Charlotte, N. C. and will handle sales and technical service for the company in North and South Carolina, Virginia, and Eastern Tennessee.

Mr. Williams has a B.S. degree in Chemistry from Lenoir Rhyne College and a B.S. degree in Chemical Engineering from North Carolina State College. He has most recently been plant manager of the Wica Company in Charlotte, N. C.

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July 27-31. Gordon Research Conferences, Organic Coatings, Colby Junior College, New London, N. H.

Aug. 10-14. 1959 Short Course on Drying Oils, Sponsored by the American Chemist's Society and the University of Minnesota Institute of Tech., Minneapolis, Minn.

Sept. 13-18. 136th National Meeting, American Chemical Society, Atlantic City, N. J.

PRODUCTION CLUB MEETINGS

(no summer meetings)

Baltimore, 2nd Friday, Park Plaza Hotel.
Chicago, 1st Monday, Furniture Mart.
C.D.I.C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Hotel Alms.
Dayton — Nov., Feb., April Suttmilers.
Columbus — Jan., June, Sept., Fort Hayes Hotel.
Cleveland, 3rd Friday, Cleveland Engineering & Scientific Center.
Dallas, 1st Thursday after 2nd Monday, Melrose Hotel.
Detroit, 4th Tuesday, Rackham Building.
Golden Gate, 3rd Monday, Sabella's Restaurant, San Francisco.
Houston, Monday prior 2nd Tuesday, Rams Club.
Kansas City, 2nd Thursday, Pickwick Hotel.
Los Angeles, 2nd Wednesday, Schully's Cafe.
Louisville, 3rd Wednesday, Seelbach Hotel.
Montreal, 1st Wednesday, Queen's Hotel.
New England, 3rd Thursday, University Club, Boston.
New York, 1st Thursday, Brass Rail, 100 Park Ave.
Northwestern, 1st Friday, St. Paul Town and Country Club.
Pacific Northwest, 3rd Thursday, Washington Athletic Club, Seattle, Wash.
Philadelphia, 3rd Wednesday, Philadelphia Rifle Club.
Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.
Rocky Mountain, 2nd Monday, Republican Club, Denver, Colo.
St. Louis, 3rd Tuesday, Kings-Way Hotel.
Southern, Annual Meetings Only.
Toronto, 3rd Monday, Oak Room, Union Station.
Western New York, 1st Monday, 40-8 Club, Buffalo.

MARBON

Dr. Robert C. Springborn has become manager of research, it has been announced. He will be located at the firm's new research facilities in Washington, W. Va.

R. C. Springborn

Dr. Springborn received a B.S. degree in chemistry at the University of Illinois and a Ph.D. degree in organic chemistry at Cornell University.

Prior to joining the company, he was associated with Monsanto Chemical Co. and the Gillette Co.

His principal work and interest has been in the biosynthesis of rubber, research and development of thermoplastic resins and the use of high polymers in pharmaceutical applications.

DU PONT

Herman R. Woodall, manager of the chemical sales section in the explosives department, has been promoted to the new position of assistant director of sales for chemical and specialty products, it has been announced. Mr. Woodall will direct the sales and sales development activities for chemical and specialty products.

Tom T. Brown, assistant manager of the Duluth, Minn., sales district, will succeed Mr. Woodall as manager of the chemical sales section. **William Reynolds,** assistant manager of the chemical sales section, has been appointed special assistant to the director of sales of the explosives department.

Dr. Donald B. Killian has been appointed an assistant director of sales for the pigments department, it has also been announced. **John L. C. Brooke,** pigments district sales manager in Chicago, will succeed Dr. Killian as sales manager for white pigments. **Dr. J. B. Callaway,** west coast manager, has been named Chicago district manager.

UNION CARBIDE CHEMICALS

Transfers of two technical representatives have been announced.

They are: **Andrew H. Black** to the Chicago district from New York, and **John F. Flynn** to the New York district from Boston.

Mr. Black received a Bachelor of Science degree in Chemistry from Tufts College in 1957. That same year he came to the company.

In 1951, Mr. Flynn received a Bachelor of Chemical Engineering degree from Brooklyn Polytechnic Institute. He joined the firm in 1953.

Dr. Richard J. Kerr has been named product manager—urethane intermediates in the new chemicals group, it has also been announced.

Heading the newly-created urethane intermediates group, Dr. Kerr will be responsible for the development of new chemical intermediates, for urethane polymers in rigid and flexible foams, coatings and elastomers.

In 1953, Dr. Kerr graduated from the University of California at Los Angeles with a Bachelor of Science degree in chemistry. He received a Ph. D. degree in organic chemistry in 1956 and came to the company that year as a new chemicals technical representative.

SCHENECTADY VARNISH

Henry D. Wright has been elected president of the company, it has been announced.

Other new officers, whose appointments have been announced, are **Clinton A. Braidwood,** vice president and **George B. Tod,** treasurer. Mr. Tod has also been elected a director of the concern.

H. D. Wright, formerly executive vice president and treasurer, has been with the company for over 25 years. He joined the firm shortly after his graduation from the Wharton School of Finance & Commerce at the University of Pennsylvania.

During his career, Mr. Wright has held a number of manufacturing, sales and administrative posts with the concern.

Mr. Braidwood has been manager of the company's resin plant at Rotterdam, N. Y. He will continue in this capacity in addition to his new responsibilities.

Mr. Braidwood, who joined the company as a member of the research staff in 1948, is a graduate of Michigan State College with a degree in Organic Chemistry.

Mr. Tod will continue as purchasing agent and secretary of the firm. Prior to joining the company in 1936 he was an officer of the Delaware County National Bank of Delaware, Ohio.

GELVATEX PAINT

D. A. Gendron has been named general manager of the division, a subsidiary of Shawinigan Resins Corp., it has been announced.

D. A. Gendron

Mr. Gendron has formerly been sales manager of National Paint and Varnish Company in the Southern California area.

Prior to that, he was associated with Northern California firms.

SOUTHWESTERN CONTAINER

Myrven H. Cron has been appointed sales-service representative for the Houston area, it has been announced.

M. H. Cron

Mr. Cron attended Rice Institute and received his degree in chemical engineering.

Since 1947, Mr. Cron has been actively engaged in servin the paint, oil, food and chemical industries; and with his appointment as representative for the company, offers a complete steel packaging service.

AMERICAN CYANAMID

Dr. Carl W. Weil has become assistant manager of the Bridgeville, Pa. plant, it has been announced.

Dr. Weil has been a member of the organization and its plastics and resins division since early 1956. During this time, he has served as a production engineer in the New York office, and operations manager of the Bridgeville plant since October, 1956.

He is a graduate of Carnegie Institute of Technology where he received his bachelor and master degrees in chemical engineering. His doctorate, also in chemical engineering, was received from the University of Delaware.

F. A. Sauter has been named sales representative in charge of a new sales and warehousing facility for the pigments division in Charlotte, N.C., it has also been announced. He will service pigments customers in North Carolina, South Carolina, Virginia and Eastern Tennessee.

Since joining the firm in 1955, Mr. Sauter has been a pigments sales representative for the company in the New York and Atlanta, Ga. areas. He formerly was associated with the Utility Color Company of Newark and J. S. & W. R. Eakins, Inc. of Brooklyn.

He is a graduate of Rutgers University in New Brunswick, N. J.

SHAWINIGAN RESINS

Judson W. Arnold has been appointed to the newly created post of director of development, it has been announced.

Mr. Arnold, who has been general manager of the Gelvatex Division, will assume his new post immediately. As director of development, Mr. Arnold will be located at the firm's main plant and executive offices in Springfield, Mass.

Succeeding Mr. Arnold as general manager of the Gelvatex Division is **Donald A. Gendron** who, since 1957, has been divisional sales manager and assistant general manager.

Prior to joining The Gelvatex Division in 1956, Mr. Arnold was technical director of the Sherwin-Williams Co. of Canada, Ltd. for eight years. He received a B.Sc. degree in chemistry from the University of New Brunswick.

Mr. Gendron, who joined the Gelvatex Division in 1957, was formerly sales manager for National Paint and Varnish Co. He is a graduate of Manhattan College, New York.

GODFREY L. CABOT

John Andrews has been named assistant director of foreign operations it has been announced.

After a six-year assignment overseas, he returns from France where he served as president and managing director of Cabot France, S.A.

Mr. Andrews joined the organization in 1945 where he worked in carbon black sales and later headed a new plasticizer division.

In 1952 he went to England where he became managing director of the English subsidiary of the parent company. He held this position until his transfer to France.

He holds a B.S. degree in chemical engineering from Tufts College School of Engineering.

EMERY INDUSTRIES

Eugene F. Warren has been appointed assistant to the executive vice president, it has been announced.

Mr. Warren will handle special assignments in connection with the chemical firm's expansion program, including foreign market operations.

A specialist on tax matters, and a C.P.A., Mr. Warren was associated for 11 years with Lybrand, Ross Brothers and Montgomery, where he was manager of the tax department, Cincinnati office.

Mr. Warren received his B.S. in Business Administration from Ohio State University.

WHITTAKER, CLARK & DANIELS

Russell J. Stuebing has joined the sales staff as representative for products to the paint and rubber industries, it has been announced.

Mr. Stuebing has been previously associated with such organizations as C. K. Williams, Sherwin Williams Co., and Krumbhaar Chemicals, Inc.

SUN CHEMICAL

Ben A. Gorlin has been appointed sales manager of Ampruf Paint Co., a division of the firm, it has been announced.

Mr. Gorlin has been associated with the company since 1937.

MINERALS & CHEMICALS

Robert W. Wert has been appointed field representative for chemical distributor operations, it has been announced.

R. W. Wert

As a distributor field representative, Mr. Wert will provide direct technical assistance to the firm's 30 chemical distributors, and their customers in the application of aluminum silicate pigments and attapulgus clays.

He has been associated with the company for 14 years and was formerly manager, agricultural sales.

Mr. Wert is a graduate of Duke University where he received a Bachelor of Science degree in Chemistry.

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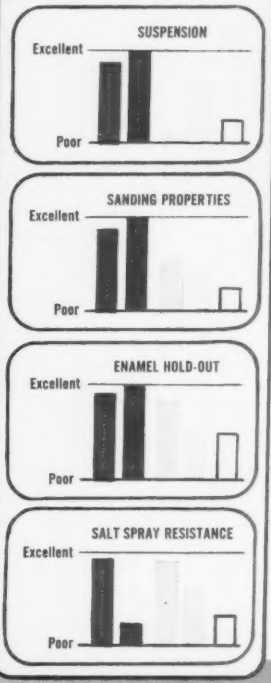
■ = HYDRITE 10 and BARYTES ■ = HYDRITE 10 = BARYTES

= $CaCO_3$ □ = TALC



The accompanying graph shows the effects of various extenders on the properties of industrial primers. The tests were made on a typical oleoresinous baking primer, with commonly used extenders: Hydrite 10, barytes, Hydrite 10 in combination with barytes, talc, and calcium carbonate.

It was shown that the Hydrite 10-barytes combination gave the optimum overall performance in all properties tested. These were: suspension, sanding properties (ease of removal of the primer film by sanding), enamel hold-out (gloss of an enamel strip over the primer tested), and salt spray resistance.

Our Technical Service Department is available to examine the possibilities of improving the quality and reducing the cost of your formulations.

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